Assessment of *Salvadora Persica* (Siwak) Aqueous Extract as an New Endodontic Irrigant in Comparison to Sodium Hypochlorite (Bacteriological, Histopathological, and Immunological Studies)

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Abstract

The aim of this study was to assess *Salvadora persica* (Siwak) aqueous extract, as an endodontic irrigant in comparison with sodium hypochlorite and normal saline through a microbiological, histopathological, and immunological studies.

The microbiological study started with the determination of both the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the *Salvadora persica* aqueous extract through the broth dilution method, followed by assessing the antimicrobial effect of the *Salvadora persica* aqueous extract against *Staphylococcus aureus, Streptococcus mutans, Pseudomonas aeruginosa, Escherichia coli,* and against aerobically and anaerobically incubated microflora taken from open-canalled teeth, in comparison with sodium hypochlorite and normal saline through using the Muller-Hinton agar-disk diffusion method.

Seventy-five rabbits were included in the histopathological study, in which bone implantation test was used to assess the biocompatibility of *Salvadora persica* aqueous extract, sodium hypochlorite, and normal saline after 3 days, 7 days, 14 days, 30 days, and 45 days of implantation in the tibia bone.

In the immunological study, the effects of the three types of irrigants on the cellular immune system were assessed by the delayed type hypersensitivity (DTH) skin testing after intradermal injection of different amounts of these materials (10 μL, 20 μL, and 30 μL) in the flank region of 75 rabbits previously implanted with the materials in the tibia bone in the histopathological study. On the other hand, blood sera were collected from the rabbits' ear veins and analysed through enzyme-linked immunosorbent assay (ELISA) to assess the effects of these materials on the humoral immune system.

The microbiological study results showed that the MIC and MBC of *Salvadora persica* aqueous extract was 20%. The disk diffusion test results revealed that *Salvadora persica* aqueous extract exhibited antimicrobial action comparable to sodium hypochlorite with statistically no significant differences. However, normal saline was shown to have no antimicrobial action at all.

Results from the histopathological study showed that *Salvadora persica* aqueous extract was more biocompatible than sodium hypochlorite and normal saline. However, sodium hypochlorite was the most irritant material. In addition, bones implanted with *Salvadora persica* aqueous extract exhibited faster bone healing as mainfested by faster bone trabeculae formation and mature bone formation.

DTH skin testing results showed that both *Salvadora persica* aqueous extract and sodium hypochlorite stimulated the cellular immune system of the rabbits in contrast to normal saline which had no effect. However, ELISA test results revealed that *Salvadora persica* aqueous extract had no effect on the humoral immune system in contrast to sodium hypochlorite.