Effect of Boswellia sacra and Moringa oleifera leaf extract as root canal irrigants on bacterial reduction and biofilm eradication in single-rooted teeth. (A Comparative In Vitro Study)

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Method Article

Keywords: Irrigation, boswellia, moringa, biofilm, eradication, reduction

Posted Date: January 12th, 2024

DOI: https://doi.org/10.21203/rs.3.pex-2523/v1

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Abstract

The aim of this study is to evaluate the efficacy of *Boswellia sacra* and *Moringa olifera* leaf extract as intra-canal irrigation in terms of bacterial reduction and biofilm eradication.

Single-rooted mandibular premolars will be instrumented and categorized into 3 experimental groups depending on the irrigant used: Group I: irrigation with 10% B. sacra extract. Group II: irrigated with 20% Moringa olifera. Group III: control group irrigated with 2.5% sodium hypochlorite. Scanning electron microscopic analysis will be performed to assess biofilm eradication in the coronal, middle, and apical portions of each root canal along with microbial sampling and CFU counting for bacteriological reduction analysis.

Introduction

Herbal irrigants have gained attention in the field of endodontics as potential alternatives to conventional chemical irrigants. These natural irrigants are derived from various plant sources and offer several advantages. They are generally biocompatible, possess antimicrobial properties, and have the potential to promote tissue healing. Herbal irrigants such as tea tree oil, propolis, aloe vera, and neem have been studied for their efficacy in disinfecting the root canal system and eliminating bacteria, fungi, and biofilms. Additionally, these herbal solutions may exhibit anti-inflammatory and antioxidant effects, further aiding in the healing process. While more research is needed to fully understand their effectiveness and safety, the exploration of herbal irrigants presents an intriguing avenue for the advancement of endodontic treatment.

One of the most virulent bacteria present in the root canal system affecting our endodontic treatment outcome is *Enterococcus faecalis* (*E. faecalis*). They are opportunistic bacteria associated with different forms of peri-radicular diseases. This is due to its ability to adhere to dentinal walls, penetrate deep into the dentinal tubules and colonize the dentin in the form of biofilm (Mohamed et al., 2005).

NaOCl is the most used endodontic irrigant because it has a broad antibacterial spectrum and the ability to dissolve organic tissues. However, NaOCl is a potential irritant of periapical tissues, especially at high concentrations, can induce inflammatory reactions, and has an unpleasant taste and odor (Gonçalves et al., 2016). So, the search for alternative root canal irrigant with a lower potential to induce adverse side effects is commonly suggested.

Herbal and natural products have gained research interest worldwide in recent years due to their medicinal properties such as biocompatibility, antimicrobial activity, anti-inflammatory and antioxidant properties which have favored their use in endodontics as root canal irrigants (Hosny et al., 2021).

Reagents

Equipment
**Procedure**

**-Sample Preparation:**

Teeth will be decoronated at the cementoenamel junction using a low-speed diamond saw under sufficient water coolant to prevent the development of cracks or craze lines. All the teeth will be adjusted to a length of 17 mm for standardization purposes.

**- Sample Sterilization:**

The roots will be sterilized at 120°C in an autoclave for 30 minutes.

**Grouping of teeth:**

Teeth will be placed in opaque, sequentially numbered and sealed envelopes to allow for the random allocation of teeth into groups, teeth will be divided randomly into 3 groups.

**Mature biofilm preparation and root canal inoculation:**

The roots will be contaminated with 1 McFarland of the prepared bacterial suspension of *E. faecalis* (ATCC 29212) using sterile insulin syringe (gauge 27) and will be incubated 1 week under aerobic conditions at 37 °C (Bago et al. 2013, Martos et al. 2013).

**Sample (S1) collection:**

S1 will be obtained by the sequential use of 3 paper points # 25.

**Intracanal irrigation application:**

- The irrigants *B. Sacra* and *M. olifera* fresh irrigants will be prepared as mentioned before. Each irrigant will be injected into root canals; according to the assigned group; To simulate clinical conditions, all irrigation procedures will be performed as recommended.

- All teeth will receive the same volume of irrigant (5 ml prior to instrumentation, 5 ml between each file and 5 ml as final flush after root canal instrumentation to reach a total volume of 25 ml in total) using a syringe and a 30-gauge-max-i-probe side vented needle[1] introduced under strict aseptic conditions 2 mm shorter than the working length.

**Sample (S2) collection**

After neutralizing the irrigant with 5 ml saline before sample collection. Each canal will be dried with sterile paper points and then will be filled with (PBS). A sterile size 15 K-file will be inserted into the canal within 1 mm of the working length and circumferentially filed for 30 s. The canal contents will be absorbed with three sterile paper points.
The samples will be transferred to Wasserman tube containing 1ml of (PBS) to remove loosely attached bacteria, then it will be transferred to another Wasserman tube containing 1ml of BHI and the tubes will be vortexed to resuspend the remaining viable bacteria on the paper point. Serial dilutions will be made and these dilutions will be plated on bile esculin plates. These plates will be incubated for 24 hrs at 37°C aerobically. After 24 hrs, CFU will be calculated.

A) Samples preparation for SEM assessment:

the roots will be grooved vertically using a diamond disc without touching the canal. Then they will be split in the buccolingual direction, longitudinally into 2 halves using a chisel and a mallet. Only one-half will be used to be examined by SEM.

References


