Comparative evaluation of sodium hypochlorite, neem, M. citrifolia Juice and Propolis root canal irrigants against E. faecali.

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Abstract

Introduction: Root canal irrigation helps in eliminating the microorganisms present in the canal system.

Objectives: The present in vitro research was done to assess the efficiency root canal irrigants; sodium hypochlorite, neem, M. citrifolia Juice, and Propolis against E. faecali.

Materials and method: In present study 5 groups of root canal irrigants (sodium hypochlorite, neem, M. citrifolia Juice, Propolis, distilled water as controlled group) were tested for efficacy against E. faecali.

Results: There was highest inhibition zone observed with sodium hypochlorite group followed by Neem (Azadirachta indica), M. citrifolia Juice, Propolis and least was observed in control group with distilled water.

Conclusion: The tested root canal irrigants sodium hypochlorite group followed by Neem (Azadirachta indica), M. citrifolia Juice, Propolis are effective against E. faecali.

Key words:
Neem (Azadirachta indica), M. citrifolia Juice, Propolis, E. faecali.

Introduction

Microbial contamination of root canal can be reduced by bio-mechanical procedure of the root canal. However, mechanical preparation along with elimination of root canal pathogens by root canal irritants is the key prerequisites for better prognosis of endodontic therapy. Cases with continual infection where the microorganisms are not removed completely which requires more consideration since it can
results in to reinfection. To achieve this, alone mechanical preparation of the root canal may not be adequate. A disinfection regimen need optimum root canal shaping so that the disinfectant reaches unreachable areas.²

Walker has stated 3 objectives for irrigating process such as: antimicrobial action, remnant tissue dissolution, and canal lubrication.² Three Because of narrower canal configuration, the apical third of the root canal is the most difficult to clean.³

Sodium hypochlorite is the well-known gold standard root canal irrigant used in endodontic practice.¹,⁴ But the drawbacks of sodium hypochlorite include unpleasant taste, toxicity and causes hypochlorite accidents. So to overcome this side effect and to meet the requirements of an ideal irrigant, various herbal and other irrigants were tried by many researchers.⁴

It has been found that, herbal products have natural anti-inflammatory, antimicrobial, and antioxidant properties along with biocompatibility.¹ Numerous natural plant extracts are suggested to use as endodontic irrigant since they have therapeutic benefits with antimicrobial properties. Contaminualraise in antibiotic resistant strains and side effects of chemical irrigants has made to the search for alternate herbal medicaments.⁵

Many herbal products have been studied in vitro for their use as irrigant such as; propolis, neem, tulsi, miswak, tulsi, triphala, tea tree oil, noni, turmeric, green tea extract, etc.¹,⁴,⁵,⁶

Use of Neem (Azadirachtaindica) as an endodontic irrigant might be advantageous because it is biocompatible, antimicrobial, antiadherent, and antioxidant.¹

Propolis is a resinous brown material obtained from bees. Flavonoids, is the chief component of propolis, which has antimicrobial, antioxidant, anti-inflammatory and anticancer properties.¹

Enterococcus faecalis is an anaerobic gram-positive bacterium responsible for 80–90% of enterococcal infection. Enterococcus faecalis most commonly cultured from failed root canals that undergo retreatment and also from non-healing endodontic cases. Hence root canal irrigants should have a good antimicrobial property to improve the instrumentation procedures.⁴,⁵

There are very few reported studies on comparison of various herbal endodontic irrigants, hence the current research was done to assess the efficacy of various root canal irrigants against Enterococcus faecali.⁴

Materials and Methods

The present in vitro research was conducted in the department of conservative dentistry. In present study 5 groups of root canal irrigants (sodium hypochlorite, neem, M. citrifolia Juice, Propolis, distilled water as controlled group) were tested for efficacy against E. faecali.

Neem Irrigating Solution Preparation: Fresh A. indica(neem) leaves were collected and washed with distilled water, later 25 gm of fresh neem leaves was added to 50 mL of absolute ethanol and soaked for 1 to 2 minutes. Mixture was filtered for coarse residue using muslin cloth. This process was repetitive again for coarse residue. These extracts were and filtered using fast filter paper. To remove the alcohol part, the extract was placed on water bath until it reduced to 25 mL solution. This solution was stored in airtight amber-colored container.¹

M. citrifolia Juice (noni) Preparation: 6 mL of M. citrifolia juice which is commercially
available as Noni was mixed in 100 mL of sterile water to make it M. citrifoli juice of 6%.\(^7\)

**Propolis Preparation:** Around 11% alcoholic extract was prepared by diluting commercially available 33% concentration of propolis using warm saline in 2:1 ratio.\(^1\)

**Preparation of filter discs:** Round discs (Whatman No 1 filter paper) of 6 mm diameter were cut from the filter paper. In hot air oven at 60 degree C they were dried and sterilized.

On nutrient broth pure culture of microorganisms was grown then using inoculation loops cultured on chocolate agar plate. Under aerobic condition the plates were incubated at 37 degree C for 24 hours and examined for zones of inhibition.\(^4\)

**Antimicrobial Assay test**

*E. faecalis* (ATCC 29212) species were acquired from Curewell Diagnostic Centre, Gurgaon, India. In brain heart infusion (BHI) broth the culture was grown overnight at 37°C and inoculated in Mueller–Hinton agar plates and adjusted to 0.5 turbidity reading on McFarland scale (1.5 × 108 bacteria/ml). Agar disc diffusion method was used to assess the antibacterial inhibition zones around NOCL, neem extract, propolis, *M. and citrifolia* medicaments and distilled water as the control group. Each medicament was added to the respective BHI wells. The plates were incubated in an incubator for 24 h at 37°C. After incubation, bacterial inhibition zone around each well was noted.

The obtained data for both the groups were statistically analyzed with ANOVA test using Statistical Package for the Social Sciences for Windows, version 20.0. (IBM Corp. Armonk, NY) (P less than 0.001).

### Results

Table 1: Zone of inhibition against *E. Faecalis* by different root canal irrigants

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium hypochlorite</td>
<td>31.3</td>
<td>1.134</td>
<td>0.335</td>
</tr>
<tr>
<td>Neem (Azadirachta indica)</td>
<td>21.4</td>
<td>1.12</td>
<td>0.235</td>
</tr>
<tr>
<td>Propolis</td>
<td>16.6</td>
<td>1.043</td>
<td>0.261</td>
</tr>
<tr>
<td>M. citrifolia Juice</td>
<td>19.8</td>
<td>1.023</td>
<td>0.235</td>
</tr>
<tr>
<td>Control (Distilled water)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

SD=Standard Deviation, SE=Standard error. ANOVA, \(P<0.001\)

Table 1 shows zone of inhibition against *E. Faecalis*. Highest inhibition zone was observed with Sodium hypochlorite group (31.3) followed by Neem (Azadirachta indica) (21.4), M. citrifolia Juice with 19.8, Propolis with 16.6 and least was observed with control group of distilled water.

**Discussion**

Root canal infection mostly occurs due to presence of microorganisms in the root canal.\(^1\) The present research assessed the efficacy of herbal root canal irrigants against *E. Faecalis*.

Daga et al compared the antimicrobial effectiveness of sodium hypochlorite, with herbal irrigants miswak, neem, propolis. They concluded that Sodium hypochlorite was better irrigant after that propolis, neem, and miswak. EndoVac irrigation system was more efficient in removal of *E. faecalis* than needle irrigation group.\(^1\)

Damre evaluated the antimicrobial action of herbal vs chemical endodontic irrigation *E. Faecalis* and concluded that honey showed the greater inhibition zone followed by neem, sodium hypochlorite, haldi and aleo-vera.\(^4\)
VenkataTeja et al did a systematic review on Sodium hypochlorite and herbal agents as endodontic irrigant. They concluded that herbal irrigants cannot be indicated as a main root canal irrigant for disinfection.2

Makkar et al evaluated the endodontic irrigants on apical extrusion of debris. They concluded that Sodium hypochlorite in the concentration of 3% showed the greatest amount of extruded debris.8 Babaji et al evaluated the antimicrobial efficacy of herbal endodontic irrigants (Azadirachta indica extract, Morinda citrifolia, and Aloe vera) with sodium hypochlorite (NaOCl). They concluded that herbal extracts had inhibitory zone against E. faecalis.5 The findings are similar to our results.

Gupta-Wadhwa et al evaluated the antimicrobial efficacy of three herbal irrigants Cinnamomumzeylanicum (CZ), (SA) against E faecalis. They stated that Syzygiumaromaticum, Cinnamomumzeylanicum, and Ocimum sanctum exhibited reduction of E faecalis.9 Paul et al evaluated the effectiveness of various root canal irrigants (17% EDTA along with ultrasonication, 25% citric acid, MTAD). They concluded that all the tested irrigants MTAD worked well in the middle and cervical third, whereas MTAD had excellent results in the apical third.3 Mali et al assessed the effectiveness of different herbal irrigants on the removal of smear layer. They concluded that Tulsi, nutmeg and myrobolan can be effectively used as an irrigant in primary teeth.6

Afshan et al assessed the antimicrobial effectiveness of Morinda citrifolia, neemleaf extract, and saline, against E faecalis. They stated that Neemleaf extract showed maximum inhibition against E. faecalis showed by saline revealed the minimum antimicrobial efficiency with minimum inhibition.7 The results are comparable to our outcomes. Singh et al estimated the various canal irrigation activation systems (Endo Activator (EA) and Canal Brush (CB)) on smear layer elimination. They found that CB eliminate smear layer more proficiently from the root canal than EA and F-File in coronal and apical area.10

The drawback of the present study was that it was in vitro study and different irrigating solutions were not tested. Additional in vivo researches are required to validate the results.

Conclusion

Within the limitation the present study indicated that, sodium hypochlorite group followed by Neem (Azadirachta indica), M. citrifolia Juice, Propolis are effective against E. faecali.

Ethical clearance: obtained

Conflict of interest: Nil

References

3. Paul ML, Mazumdar D, Niyogi A, Baranwal A. Comparative evaluation of the efficacy of different irrigants