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RESEARCH ARTICLE

COMPARATIVE EVALUATION OF DIFFERENT INTRACANAL MEDICAMENTS AGAINT E. FECALIS – AN IN VITRO STUDY

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ABSTRACT

Herbal products have been used since ancient times in folk medicine, involving both eastern and western medicinal traditions. Many plants with biological and antimicrbiological properties have been studied since there has been a relevant increase in the incidence of antibiotic overuse and misuse. In dentistry Phytomedicines has been used as anti-inflammatory, antibiotic, analgesic andsedative agents. In endodontics because of the cytotoxic reactions of the most of the commercial intracanal medicaments used and their inability to eliminate bacteria from dentinal tubules, trend of recent medicine attends to use biologic medication extracted from natural plants.The aim of this studyto compare the antimicrobial activity of this cumin essential oil with conventional antimicrobial agents which use in dentistry as intracanal medicament.

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INTRODUCTION

There are so many different type of aerobic and anaerobic microorganisms found in oral cavity which is responsible for root canal infections (Peciuliene, 2000). Out of them some microorganisms shows high level of resistant against disinfection procedures. Because of their ability to form a protective biofilm which help them to stay alive beside unfavourable conditions in root canal. Therefore, they may not be completely removed from the root canal, alone by intracanal medicaments (Gomes, 1996). Calcium hydroxide and Chlorhexidine is the two most commonly used intracanal medicaments (Maekawa, 2011 and Siqueira, 1999). However, both Calcium hydroxide and Chlorhexidine are not capable to complete removal of these highly resistant microorganisms. Considering the increasing bacterial resistance against antibiotics and some shortcomings of Calcium hydroxide and Chlorhexidine as intracanal medicaments, it seems rational to look for other alternatives. Now days researches focused on other herbal intracanal medicament for eradication of resistant microorganisms which are present in the root canal.

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The purpose of this *in vitro* study was to assess prospective of essential oil to be used as a root canal medicament by comparing it's antibacterial activity to triple antibiotic paste, Chlorhexidine as well as Calcium Hydroxide on oral microorganisms.

MATERIALS AND METHODS

Isolation of Microorganisms

E.faecalis has been isolated from the teeth with persistent apical periodontitis that mixtures have tested.

Preparation of the Medicament

The seeds of cumin have collected from lucknow region in Uttar Pradesh and identified and authenticated by an expert plant taxonomist, according to the morphological description and previously collected known samples. Then 200g of the grounded seeds (powder) was mixed with 800 mL of distilled water. The essential oil was isolated. The oil was stored in -70^{0}C in order to remove the water-soluble components. In order to prepare the known concentration for a water-soluble essential oil, we initially weighted a defined concentration of

the oil and dissolved it in a defined volume of dimethyl sulfoxide (DMSO).

Materials for Experiments

GROUP I - CALCIUM HYDROXIDE
GROUP II - CUMIN ESSENTIAL OIL
GROUP III- CHLORHEXIDINE
GROUP IV- TRIPLE ANTIBIOTIC PASTE

Disc Diffusion Method

Disc diffusion method was used for the primary evaluation of antimicrobial susceptibility of the medicaments.100µL of each bacterial suspension (1.5×108 CFU/mL) were streaked on BHI agar plates separately. After 24 hrs of incubation, 50 µL of each medicament was added in sterile blank 6-mm filter paper discs and placed on the plates. The plates were left under laminar air flow for 15 min and incubated for 24 h. After incubation, the zone of inhibition around each disc was measured. (Fig.1.)

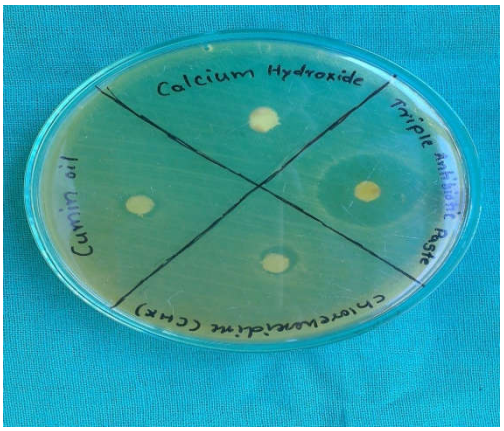

Fig.1. Disc diffusion method

RESULTS

Statistical analysis

Data were summarized as Mean ± SE (standard error of the mean). Groups were compared by one way analysis of variance (ANOVA) and the significance of mean difference between the groups was done by Tukey's HSD (honestly significant difference) post hoc test after ascertaining normality by Shapiro-Wilk's test and homogeneity of variance by Levene's test. A two-tailed (α=2) p value less than 0.05 ($p<0.05$) was considered statistically significant. Analysis were performed on SPSS (Windows version 17.0).

Results and Observations

The present study deals with herbal endodontics and compares the efficacy of ancient remedy for modern intra canal medicaments. Total 40 samples were selected and randomized equally into four groups and treated with calcium hydroxide (Group I), cumin essential oil (Group II) ,chlorhexidine (Group III) and triple antibiotic paste (Group IV). The outcome measure of the study was zone of inhibition measured in millimeter (mm). The zone of inhibition of four groups is summarized in Table 1 and also depicted in Fig. 1.

Table 1. Zone of inhibition (mm) of four groups

Group	Zone of inhibition (Mean ± SE, n=5)	F value	p value
Group I	0.23 ± 0.15	1055.42	<0.001
Group II	2.30 ± 0.09		
Group III	2.96 ± 0.07		
Group IV	7.82 ± 0.06		

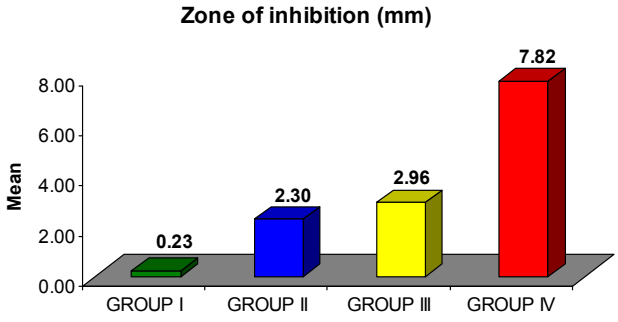

Fig. 2. Mean zone of inhibition of four groups

Table 1 and Fig. 2 both showed that the mean zone of inhibition of Group IV was the highest followed by Group III, Group II and Group I the least (Group I < Group II < Group III < Group IV). Comparing the mean zone of inhibition of four groups, ANOVA showed significantly different zone of inhibition among the groups ($F=1055.42$, $p<0.001$) (Table 1). Further, comparing the mean zone of inhibition between the groups, Tukey test showed significantly ($p<0.001$) different and higher zone of inhibition of Group II (90.0%), Group III (92.2%) and Group IV (97.1%) as compared to Group I (Table 2). Furthermore, the mean zone of inhibition of both Group III (22.3%) and Group IV (70.6%) was also found significantly ($p<0.001$) different and higher as compared to Group II. Moreover, the mean zone of inhibition of Group IV (62.1%) was also significantly ($p<0.001$) different and higher as compared to Group III.

DISCUSSION

In current research group I (calcium hydroxide) showed no inhibition zone, according to M.

Table 2. Comparison of mean difference in zone of inhibition between the groups by Tukey test

Comparison	Mean difference	q value	p value	95% CI of difference
GROUP I vs. GROUP II	-2.07	20.93	< 0.001	-2.447 to -1.693
GROUP I vs. GROUP III	-2.73	27.6	< 0.001	-3.107 to -2.353
GROUP I vs. GROUP IV	-7.59	76.75	< 0.001	-7.967 to -7.213
GROUP II vs. GROUP III	-0.66	6.674	< 0.001	-1.037 to -0.2829
GROUP II vs. GROUP IV	-5.52	55.82	< 0.001	-5.897 to -5.143
GROUP III vs. GROUP IV	-4.86	49.14	< 0.001	-5.237 to -4.483

Evans et al there is a marked clinical problem in endodontic treatment. *E. faecalis* is known to be resistant to the alkaline bactericidal effect of calcium hydroxide, yet the survival mechanisms of *E. faecalis* that enable it to tolerate exposure to the high pH of calcium hydroxide are poorly understood

(Evans, 2001). The current research has performed to investigate the potential of using cumin essential oil as an intracanal medicament. The chemical components of the cumin essential oil have determined to avoid the lack of standardization and also to have a better understanding of its bioactivity. The use of antimicrobial intracanal medicaments with reasonable biocompatibility will result in elimination of the remained organisms in root canal system and increase the rate of favorable outcomes of root canal treatment. Plant essential oils are potential sources of new antimicrobial compounds especially against bacterial pathogens (Cowan, 1999). It has been demonstrated that the aldehyde and ketone components of the essential oils relate to their level of antimicrobial activity (Arora, 1999). Strain of E. faecalis has isolated from the previously root filled teeth with failed endodontic treatment and this medicinal plant was tested on them (Megraj, 2011). The reason to select this plant was its strong background in history regarding the antimicrobial activity. Previous researches had shown that cumin has promising antibacterial, antifungal and antioxidant activity (Škrovankova, 2011). A recent in vitro study showed that compared to Calcium Hydroxide, the Triple antibiotic paste is highly effective against E. faecalis (Adl, 2017). The results has compared with that of triple antibiotic paste,CHX gel and calcium hydroxide since these are one of the most famous intracanal medicaments.

Conclusion

Within the limitations of the present study it was concluded that Cuminumcyminum essential oil exhibited a moderate antimicrobial activity against the microbial flora of the teeth. Furthermore, the level of hydrophobicity of this plant essential oils and their relative possible effect on effectiveness of the antimicrobial action is another issue remained to be investigated. Therefore, a conclusive comment on its application in root canal treatment should not be made until further evaluations have been performed on animal or human models.

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