

In vitro evaluation of Turmeric Extract as an Intracanal Medicament against *Enterococcus faecalis* in deciduous teeth

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ABSTRACT

Aims & objective: Herbal medicine are useful and effective source for treatment of various disease processes in dental. Within this background, the present study examined the antimicrobial effect of curcumin against *E. faecalis* biofilm in root canal system in teeth.

Material & Methods: The study was conducted in Department of Pedodontics, RUHS Dental College, Jaipur in collaboration with the Dept. of Microbiology, RUHS Medical College, Jaipur. The organism selected in the present investigation were *E. faecalis* (NCIM 5025), as it has been the most prevalent bacteria in the failed root canal system.

Results: The total number of CFU count of *E. faecalis* in untreated Group 2 (mean 94.33 ± 8.805) was significantly different from Group 1 (mean 43.87 ± 5.986) and table 2 showed reduction of CFU count highly statistically significant in group 1 as compare to group 2.

Conclusion: Herbal medicine are used in different conditions like as radicular abscess, non vital tooth, traumatised teeth, and periapical pathology. The herbal medicine (turmeric), reduces the bacterial population in root canal system and favours the prognosis of teeth.

Keywords: Turmeric, Deciduas teeth, CFU count, *Enterococcus fecalis*.

INTRODUCTION

Phytomedicines were used since ancient times in dentistry. Herbal medicine are useful and effective source for treatment of various disease processes in dental. Even though chemo-mechanical preparation of root canal is able to reduce the number of bacteria, the intracanal herbal medicament with antibacterial action is required to maximize the disinfection of root canal system.¹

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 is to use biologic medication extracted from natural plants.² The herbal products are also being increasingly used as sedatives, or plaque reduction and healthy gums.

a. Phytotherapeutic substances are generally classified into three groups³

- Plant products
- Animal products
- Mineral origin.

b. In dentistry, they are used as⁴

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- Antimicrobial agents
 - Anti-inflammatory agents
 - Sedative and anxiolytics.
- c. Miscellaneous endodontic irrigants, medicaments and endodontic retreatment.

The endodontic treatment were successful on the basis of elimination of micro organisms from the root canal.⁵ The root canal system have complex nature, preparing of canal is often not enough to reduce the bacterial count. A combination of instrumentation, irrigation and intracanal medication is used.⁶ Though instrumentation and irrigation reduce the bacterial count in the root canal to a great extent, some bacteria mainly *E. faecalis* will stay back and continue to multiply. *E. faecalis* is the most persistent bacteria which may cause flare up or re infection. Various intracanal medicaments like calcium hydroxide, antibiotics, steroids, etc have been tried and calcium hydroxide based intracanal medicaments are the gold standard. There are many disadvantages of the currently available intra canal medicaments. The elimination of micro organisms from the root canal is a challenge there is a need to identify the best intracanal medicament available.

In order to overcome the shortcomings of the present medicaments, herbal plant extracts can be used. In endodontics, recent trend attends to use biologic medication extracted from natural plants.⁷ Turmeric (*Curcumin longa*) has been used for 1000 of years as a medicinal herb. The Curcumin, a phenolic compound has shown bactericidal properties by clinical testing with a greater medicinal effect like antioxidant, anti-inflammatory, antimicrobial, antispasmodic, anticancer and many other properties which may prove to be a boon to dentistry. This study intended to explore the antibacterial property of Curcumin for its use as an intracanal medicament owing to its antibacterial properties, ease of availability, low cost and lack of adverse effects.⁸ Within this background, the present study examined the antimicrobial effect of curcumin against *E. faecalis* biofilm in root canal system in teeth.

MATERIAL & METHODS

The study was conducted in Department of Pedodontics, RUHS Dental College, Jaipur in

collaboration with the Dept. of Microbiology, RUHS Medical College, Jaipur. The organism selected in the present investigation were *E. faecalis* (NCIM 5025), as it has been the most prevalent bacteria in the failed root canal system.

Preparation of samples:

Thirty single canalled primary teeth which were extracted for therapeutic reasons were stored in saline till use for the study after disinfecting with 5.25% NaOCl to remove surface soft tissue & organic debris. The teeth were sectioned horizontally into coronal, middle and apical section using a carbide disc in a straight hand piece. The 5mm middle segment was taken and the root canal of each specimen was enlarged with No.10 round bur to standardize the internal diameter of canal.

Smear layer removal from the samples

The smear layer was removed by placing it in a 17%. EDTA followed by 5.25% NaOCl for 5 minutes. Each segment was then placed in a sterile tray.

Preparation of the inoculums

Single colony of *E. faecalis* from MRS agar plate was inoculated into MRS broth. The broth was then incubated at 37 °C for 48 hours to obtain bacterial suspension.

The segments were placed in MRS broth containing the culture of *E. faecalis* and incubated for 5 days at 37°C to infect the dentinal tubules.

After 5 days the segments were removed from the broth with a sterile forceps and rinsed with sterile water and blotted dry with sterile gauze.

The 30 specimens were randomly divided into 2 groups of 15 specimens each and kept upright in petridishes which contained nutrient agar by pressing the segment into the media as follows.

Group 1: A paste made from Turmeric extract (curcumin with propylene glycol)

Group 2: Control group in which no medicament is placed.

Procedure:

Table 1: Showing the total number of CFU counts of E. Faecalis

Group 1		Group 2	
Tooth no.	CFU count	Tooth no.	CFU count
1	40	1	88
2	44	2	94
3	38	3	103
4	56	4	85
5	41	5	98
6	36	6	93
7	54	7	115
8	47	8	92
9	38	9	89
10	39	10	78
11	43	11	94
12	51	12	96
13	46	13	103
14	44	14	99
15	41	15	88

GROUP 1 - A paste made from Turmeric

GROUP 2- Control (untreated)

Table 2: Comparison of Turmeric and untreated with respect to CFU

	Number of cases	CFU (mean±SD)	P- value
Turmeric	15	43.87±5.986	<0.0001***
Control (untreated)	15	94.33±8.805	

The powder and liquid was mixed to a creamy consistency. The creamy medicament was then taken in a lentulospiral and applied. The pH of the medicaments immediately on mixing was measured with help of a pH strips and these segment were placed back in nutrient agar and kept for incubation at 37°C and 100% humidity for 1 week. At the end of one week, the segments were removed from the Petri dishes and the paste was removed using 2ml of sterile water irrigation and dried with gauze and paper points. For testing the bacterial survival, dentinal shavings within the canal were collected using round burs of increasing diameter. They were collected in 2ml of Eppendroff tube.

The MRS suspensions were further diluted using double dilution method. In order to determine CFU, 0.1ml of suspension from each tube was spread on MRS plates. The plates were incubated at 37° c for 48 hrs. C.F.U was enumerated using a digital colony counter.

RESULTS AND DISCUSSION

The total number of CFU count of E. faecalis is shown in Table 1. Untreated Group 2 (mean 94.33±8.805) was significantly different from Group 1 (mean 43.87±5.986) and table 2 showed reduction of CFU count highly statistically significant in group 1 as compare to group 2.

E. faecalis are facultative anaerobe, was chosen as the test organism because it is well recognised as a pathogen associated with persistent apical periodontitis in endodontically treated teeth and is highly prevalent in failed root filled teeth.⁹⁻¹¹

- It is non-fastidious and easy to culture.¹²
- It has been used successfully in previous studies.¹³
- It has been previously shown to infect dentinal tubules rapidly and persist within it as a mono infection for up to 10 days without any nutrition.¹⁴

Curcumin is the principle curcuminoid of the popular Indian spice turmeric, which is a member of the ginger family (Zingiberaceae). Turmeric is used extensively in foods for its flavour and color, as well as having a long tradition of use in the Chinese and Ayurvedic systems of medicine, particularly as an antiinflammatory¹⁵ and for the treatment of flatulence, jaundice, menstrual difficulties, hematuria, hemorrhage, and colic.¹⁶ Turmeric can also be applied topically in poultices to relieve pain and inflammation. The active constituents of turmeric are the flavonoid curcumin (diferuloylmethane) and various volatile oils, including tumerone, atlantone, and zingiberone. Other constituents include sugars, proteins, and resins.¹⁷ It possess good antioxidant¹³, hepatoprotective¹⁸, antimicrobial¹⁹ and anticancer activity.²⁰

The present study compared the antibacterial activity of the predominant active component of turmeric i.e., curcumin, against *E. faecalis*, the most resistant bacteria in root canal treatment. This appears to be the first report on the endodontic applications of curcumin in deciduous teeth. This material has shown antibacterial, antifungal and antiviral activity in previous studies.¹⁰

The results of this study showed that Curcumin achieved 50% killing of bacteria. We speculate that Turmeric (curcumin) is able to eliminate the matrix and the bacteria which warrant further investigation. Microbial communities in vivo are quite resistance to and difficult to eradicate with antimicrobials owing to the fact that the microorganisms to be targeted are organized in structures attached to each other and/or the root canal walls often involving a multitude of species known as microbial biofilms. The testing of antimicrobial agents against bacterial biofilms is yet to be standardized and no in vitro method accurately reflects the conditions under which microorganisms grow in vivo. So, caution should be exercised while extrapolating these results to the clinical scenario. A recent report suggested that Curcumin in aqueous preparation exhibits phototoxic effect against gram positive and gram negative bacteria.²¹ This opens up avenues for further research on the use of turmeric in photodynamic therapy of root canal systems.

CONCLUSION

Herbal medicine are used in different conditions like as radicular abscess, non vital tooth, traumatised teeth, and periapical pathology. The herbal medicine (turmeric), reduces the bacterial population in root canal system and favours the prognosis of teeth.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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