ORIGINAL RESEARCH

Ocimum Sanctum as an Intracanal Irrigant in Contemporary Paediatric Endodontics – An In Vivo Study

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ABSTRACT

Background: The bacterial biofilms of infected pediatric root canals are difficult to be eradicated by the conventional irrigants without causing systemic toxicity to the tissues. Hence, plant products with least side effects are being explored for their use as irrigants in the root canal therapy. **Aim:** To evaluate and compare the antibacterial efficacy of Ocimum sanctum L. leaves (TULSI) extract with Saline solution against dentinal bacterial biofilms. **Materials and Methods:** Twenty four deciduous teeth with necrotic pulps were selected. The first bacterial sample was collected from the radicular canals of each deciduous molar with a sterile paper cone. The biomechanical instrumentation was performed with K-files and simultaneous irrigation was done with 4% Tulsi extract solution or normal saline depending on the group to which the tooth has been randomly assigned to. The second sample was collected again with a sterile paper cone. The samples thus collected were subjected to microbiological processing and the total viable bacteria were detected and colonies formed were counted. **Results:** There was a significant reduction in the number of colonies formed after irrigating the root canals with 4% Tulsi extract. All the results were statistically analysed with Unpaired 't' test. **Conclusion:** 4% Tulsi extract can be considered as a potential irrigant in contemporary pediatric endodontics.

KEYWORDS: Ocimum sanctum, Tulsi, Intracanal Irrigant

INTRODUCTION

Root canal treatment is a therapy performed to preserve infected teeth. It involves the removal of infected pulp, followed by proper biomechanical preparation and three dimensional obturation of the canal system with a suitable biocompatible material.

However, contemporary evidence cites residual bacteria or their products (especially in the apical portion) as the most important reason for the failure of a root canal treated tooth. Microbial isolates from root canals with a persistent periapical disease have shown a high proportion of Enterococcus faecalis, Prevotella intermedia, Porphyromonas endodontalis, and Fusobacterium nucleatum.[1]

Sodium hypochlorite has been considered the golden standard as far as root canal irrigants are concerned. However, its numerous inadvertent non bio friendly characteristics cause, potential damage to developing permanent tooth buds, allergic reactions, obnoxious smell and taste, and most importantly its inability to optimally remove the smear layer.[2] Considering these issues, the search for the Holy Grail of endodontic irrigants could possibly lead us to a more natural and less synthetic herbal alternative!

Tulsi, scientifically known as Osmium sanctum is a plant of Indian origin and a herb that contains innumerable anti-microbial properties. It is used to treat a variety of illness ranging from diabetes mellitus, arthritis, and bronchitis to skin diseases.[3] Being a natural product, its safety profile is immaculate and so is its antimicrobial potency. Considering these advantages, it could well prove to be our savior as a safe and efficacious endodontic irrigant for paediatric usage.

Hence, the present *in vivo* study was conducted to evaluate the antimicrobial efficacy of Tulsi as an intracanal irrigant in paediatric endodontics.

MATERIALS AND METHODS

Preparation of the sample: Twenty four deciduous teeth with necrotic pulps, from children of both genders aged between 4 and 7 years, were selected and were treated in the Department of Pedodontics and Preventive Dentistry, Bapuji Dental College and Hospital, Davangere. Prior consent was taken from the patients 'guardians. The study was strictly designed in adherence to the Helsinki declaration (2013), and an ethical clearance for the same

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was obtained from the Institutional review board.

Study Design- Experimental, in vivo, Randomised clinical trial.

The study was conducted to evaluate the total viable bacterial counts from root canals of primary teeth undergoing endodontic treatment after irrigation with 4% Tulsi Extract.

Inclusion Criteria

- Deciduous teeth with carious lesions involving the pulp and diagnosed as necrotic, evidenced by furcal radiolucency, on a periapical radiograph.
- Children who are not undergoing any medical treatment and not taking any antibiotics.
- The children selected to participate in this study were only of those parents or legal guardians who were knowledgeable of the research and had signed the informed consent form.

Exclusion Criteria

- Necrotic pulp in the teeth, with a radiolucent area in the furcation affecting the permanent successors.
- Deciduous teeth with more than half of the total root length was resorbed.

Groups

- **Group 1**- Root canals were debrided followed by irrigation with saline solution. (Control Group)
- **Group 2**- Root canals were debrided followed by irrigation with 4% Tulsi Extract. (Experimental Group)

Clinical Procedure: The study was conducted under the strict vigilance of two investigators.

For all 24 deciduous teeth, the root length was measured with a millimeter rule on a digital IOPA (RVG), and the working length for chemico-mechanical preparation was obtained by subtracting 2 mm from the radiographic root length. After the administration of an anesthesia with lidocaine and rubber dam isolation, the carious tooth tissue and pulp chamber ceiling was removed with a small round bur at high speed and Endodontic access was achieved. For the first bacterial sample, the canals of each deciduous molar had received a sterile paper cone of a diameter that is compatible to the canal for 30 s. (Figure 1) which was then immediately transferred to the brain heart infusion (BHI). Thereafter, the biomechanical instrumentation was performed with K-files, & simultaneous irrigation with 4% Tulsi extract solution or normal saline depending on the group to which the tooth had been randomly assigned to. After the instrumentation, the radicular canals of each deciduous tooth had again received a sterile paper cone of a diameter that is compatible to the canal for 30 s. The second sample thus obtained was immediately transferred to the BHI.

The samples collected were then subjected to microbiological processing and were cultivated so that the total number of viable bacteria could be detected. The samples were homogenized in a tube shaker for 3 min, and 25 µl aliquot of this solution was placed on the plate surface containing blood agar, with a micropipette (Figure 2). Subsequently, the cultures were incubated after which it was possible to see the total number of viable bacteria colony forming units.

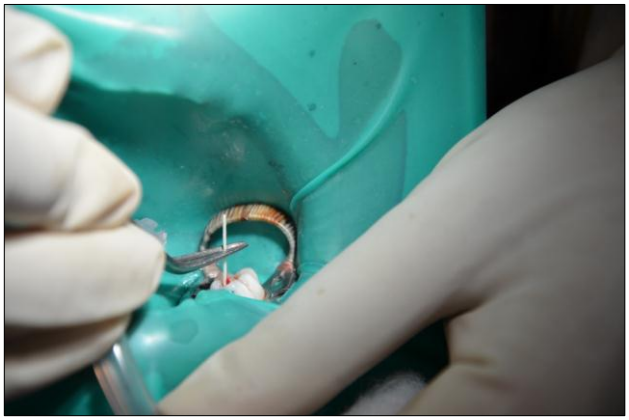


Fig 1: Insertion of sterile paper cone

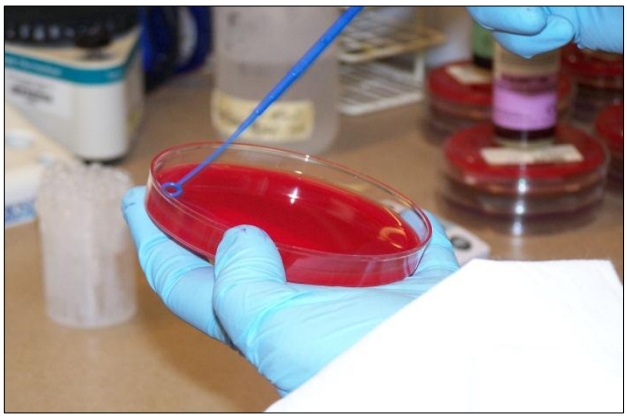
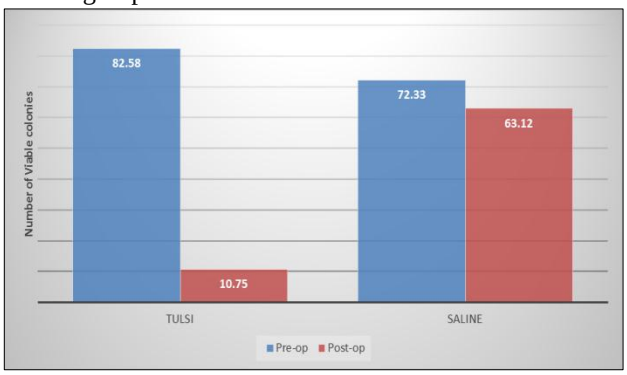


Fig 2: Placement of sample on blood agar

Statistical Analysis: Statistical analysis was done using SPSS version 17.0 and Unpaired 't' test.

RESULTS

The number of colonies formed were counted under digital colony forming unit (Figure 3). There was a significant difference in the number of colonies between post-operative samples of the Experimental and control groups. (Table No. 1) Graph 1: Shows the Pre and Post-operative mean differences between experimental and control groups.



Graph 1: Pre-op & Post-op Mean differences between exp and ctrl groups.

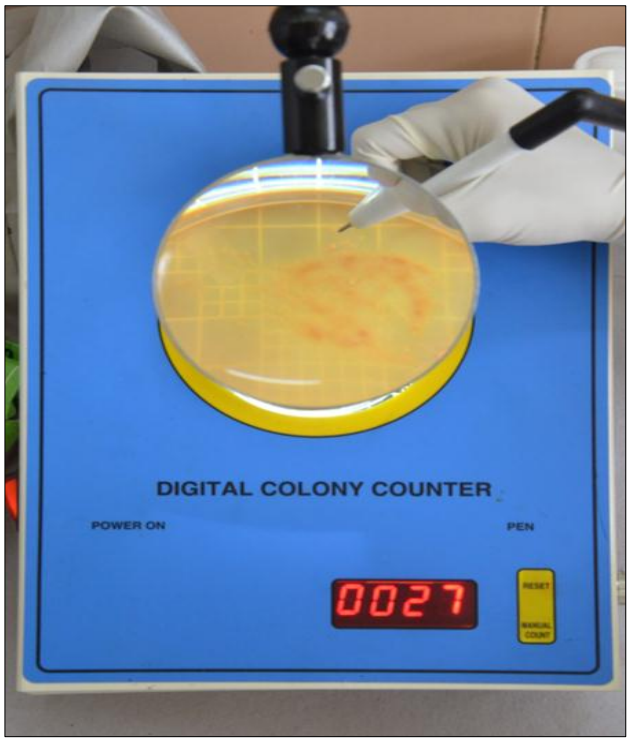


Fig 3: digital colony forming unit

Irrigant Used	Bacterial Colonies (Mean ± S.D)	T - Value	P - Value
Tulsi	10.75 ± 7.32	-5.715	0.001**
Saline	63.12 ± 30.81		**(Hs)**

Table No.1: Illustrating the mean, standard deviation and level of significance of exp and ctrl groups.

DISCUSSION

Files shape and Irrigants Clean! This sums up the paradigm shift that contemporary endodontics has witnessed. The use of chemical agents as irrigating solutions can improve mechanical debridement by flushing out debris, dissolving tissue, disinfecting root canal systems as well as removing the smear layer formed during the shaping process.[4]

The use of aqueous NaOCL became the main stay of all irrigation protocols in the 1920's thanks to the pioneering work done by H. Dakin during the World War I. Part of NaOCL's success as an irrigating solution could be attributed to its antimicrobicidal and tissue dissolving abilities.[5] However, at higher concentrations, NaOCL tends to be toxic and causes periapical inflammation, whereas, at low concentrations, it is ineffective against specific microorganisms.[6] NaOCL is short acting, and it does not impart antimicrobial substantivity.[7] Chlorhexidine also saw reasonable success as an irrigating solution when used as an alternative to or in combination with NaOCL. This was because of its lower toxicity and substantivity. Once bound to a surface it has shown prolonged antimicrobial activity, a phenomenon called substantivity.[8] But, CHX lacks tissue dissolving and smear layer removal properties.[9]

The modern trend of finding natural substitutes for chemical agents seems to be catching up with endodontics as well. There are innumerable *in vitro* studies that have investigated the activity of natural plant substances against oral bacteria. The outcomes of these earlier studies have been really encouraging as they have clearly established the potential of these GREEN REMEDIES against cariogenic as well as periodontopathic bacteria. These natural remedies include spices and herbal extracts, such as Cinnamon bark oil, Papua-mace extracts, Tulsi extracts and clove bud oil.[3] Out of all the natural agents investigated, Tulsi, scientifically known as Ocimum sanctum seems to have an edge over the others. It is a time-tested premier medicinal herb. In India, it is worshipped by the Hindus and used in ayurvedic medicine since ancient times. It has innumerable antimicrobial substances and is used in a variety of illness ranging from diabetes mellitus, to skin diseases.[10] The chemical composition of Tulsi is highly complex, containing many nutrients and other biologically active compounds, the proportion of which may vary considerably between strains and even between the plants of the same field. Furthermore, the quantity of many of these constituents is affected by the conditions relating to its growth, harvesting, processing as well as storage.[11] Eugenol (l-hydroxy-2-methoxy-4-allylbenzene), the active constituent present in Ocimum sanctum, perhaps is largely responsible for the therapeutic potential of Tulsi.[12] Hence, Tulsi was considered for the present clinical intervention to evaluate its efficacy as an irrigant for root canal therapy specifically focussing on paediatric endodontics. Further, Tulsi extract at 4% concentration was selected to maximise its antimicrobial efficacy based on the previous investigations.[13]

In the present *in vivo* study, we used Blood Agar plates to culture the pre-operative and Post-operative samples, as these plates are readily available and are more accurate to culture the implicated bacterial strains.

The present *in vivo* study proved that Tulsi – 'Ocimum sanctum' had a better antimicrobial efficacy against periapical pathogens isolated from the root canals of primary molars. These results are in accordance with a previous study which had compared the antimicrobial efficacy of Mangifera indica and Ocimum sanctum against conventional irrigants and had shown similar effects on the biofilm and planktonic organisms.[14]

Clinical Implications & Futuristic trends: The use of 4% Tulsi extract as an irrigant could herald a new beginning for paediatric endodontics. However, future research on this exciting molecule should be aimed in the direction of finding its efficacy against specific bacteria rather than relying on total viable counts alone.

CONCLUSION

In spite of showing antibacterial effects at lower concentrations, conventional irrigating solutions could prove to be toxic to tissues. On the contrary, herbal

formulations could be used even at higher concentrations as there are no deleterious side effects reported till date. The present investigation on one such natural herb - Ocimum sanctum proved its effectiveness as a potential irrigating solution in paediatric endodontics.

REFERENCES

1. Stuart CH, Schwartz SA, Beeson TJ, Owatz CB. Enterococcus feacalis: its role in root canal treatment failure and current concepts in retreatment. J Endod. 2006 Feb;32(2):93-8.
2. Jyotsna.S, Krishnappa.P, Assessment of Antibacterial Efficacy of Triphala
3. Against Mutans Streptococci –A Randomised Control Trial. Oral Health Prev Dent 2011; 9: 387-393.
4. Y. Saeki, Y. Ito, M. Shibata, Y. Sato, K. Okuda, and I. Takazoe, "Antimicrobial action of natural substances on oral bacteria," The Bulletin of Tokyo Dental College, vol. 30, no. 3, pp. 129– 135, 1989.
5. Haapasalo M, Shen Y, Qian W, Gao Y. Irrigation in endodontics. Dent Clin North Am 2010;54:291-312.
6. Abou-Rass M, Piccinino MV. The effectiveness of four clinical irrigation methods on the removal of root canal debris. Oral Surg Oral Med Oral Pathol 1982;54:323-8.
7. Spangberg L, Engström B, Langeland K. Biologic effects of dental materials. 3. Toxicity and antimicrobial effect of endodontic antiseptics in vitro. Oral Surg Oral Med Oral Pathol 1973;36:856-71.
8. Byström A, Sundqvist G. Bacteriologic evaluation of the effect of 0.5 percent sodium hypochlorite in endodontic therapy. Oral Surg Oral Med Oral Pathol 1983;55:307-12.
9. White RR, Hays GL, Janer LR. Residual antimicrobial activity after canal irrigation with chlorhexidine. J Endod 1997;23:229-31.
10. Jeansonne MJ, White RR. A comparison of 2.0% chlorhexidine gluconate and 5.25% sodium hypochlorite as antimicrobial endodontic irrigants. J Endod 1994;20:276-8.
11. Agarwal P, Nagesh L, Murlikrishnan. Evaluation of the antimicrobial activity of various concentrations of Tulsi (Ocimum sanctum) extract against Streptococcus mutans: An in vitro study. Indian J Dent Res 2010;21:357-9.
12. Miller R, Miller S. Tulsi queen of herbs, India′s holy basil. Available from: http://www.nywellnessguide.com/nutrition /070410-TulsiHerbs.php.
13. Prakash P, Gupta N. Therapeutic uses of Ocimum sanctum linn (Tulsi) with a note on eugenol and its pharmacological actions: A short review. Indian J Physiol Pharmacol 2005;49:125-31.
14. Shenoy A, Bolla N; Sayish, Sarath RK, Ram CH; Sumlatha. Assessment of precipitate formation on interaction of irrigants used in different combinations: an in vitro study.Indian J Dent Res.2013 Jul-Aug;24(4):451-5.
15. Subbiya A, Mahalakshmi K, Pushpangadan S, Padmavathy K, Vivekanandan P, Sukumaran VG. Antibacterial effi cacy of *Mangifera indica* L. kernel and Ocimum sanctum L. leaves against Enterococcus faecalis dentinal biofilm. J Conserv Dent 2013;16:454-7.

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