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COMPARATIVE EVALUATION OF MICROHARDNESS WITH MAGICAL NEEM HERB, TULSI LEAVES WITH ROSE WATER EXTRACT AND DIFFERENT IRRIGATING SOLUTIONS AT ROOT DENTIN SURFACE: AN IN VITRO STUDY

Dentistry

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ABSTRACT

Introduction –Successful Endodontic treatment requires, frequent irrigation leading to physical and chemical changes in root dentin. Sodium hypochlorite is widely used irrigant. Chlorhexidine has bactericidal effect. Neem has an isoprenoid group that has efficient therapeutic and antibacterial property. Tulsi extract has antioxidant and antibacterial activity. **Material & Methods-** 50 human single-rooted mandibular premolar teeth were selected. Endodontic access cavity was made and working length was taken. Samples were divided into 5 groups (n=10) each. Group I - Saline group, Group II - Neem, Group III - Chlorhexidine, Group IV - Tulsi leaves with rose water extract and Group V- Sodium Hypochlorite. Irrigation was done accordingly and samples were prepared for microhardness testing by mounting it in cold cure resin block and were subjected to a 100g load for a dwell time of 15s. **Results** – Mean Vickers hardness value was high in Saline (Control group) followed by Neem Chlorhexidine, Tulsi leaves with rose water extract and Sodium hypochlorite group respectively. Among all the groups, there was statistically, significant difference. **Conclusion –** Chlorhexidine had least alteration in the dentin microhardness of root surface followed by Tulsi leaves with rose water extract and Sodium hypochlorite respectively.

KEYWORDS

Endodontic irrigant, Neem, Tulsi, Vickers microhardness.

INTRODUCTION

A effective root canal preparation involves synchronized action of instrumentation and irrigants followed by a 3D obturation of the space.[1] The dentinal tubules are concealed by a smear layer due to mechanical instrumentation of the root canal. Eliminating microbes and intracanal tissue with smear layer is prime goal of endodontic treatment; it can be accomplished by vigorous irrigation during treatment.[2]

Sodium hypochlorite is utmost used irrigant due to flushing mechanism; it makes debris removal easier and aids in preventing the packing of tissue in the apical third. It is hypertonic acts as a organic matrix solvent, hydrolyzes and oxidizes protein, eradicates intracellular fluids along with carbonate and magnesium ions.[3]

The antibacterial activity of chlorhexidine is pH dependent; prevents bacterial adherence; causes osmotic imbalance. The positively charged chlorhexidine molecule is drawn to the negatively charged hydroxyapatite phosphate groups when dentinal tissue is mineralized.[4]

Neem (Azadirachta indica) is a sacred remedial tree in India; commonly known as “Indian neem/margosa tree”. It has a wide range of curative and therapeutic actions; due to the isoprenoid group of neem's compounds. Neem has already been shown to be biocompatible with the fibroblasts in the human periodontal ligament, which is a crucial argument in favour of its clinical use in endodontics. [5]

Tulsi or Tulasi or Vaishnavi (Ocimum tenuiflorum) or holy basil is a sacred plant of India. Tulsi extracts has a cleansing, detoxifying and purifying effect. Anticancer Activity, Antioxidant Activity, Antidiabetic, Antimicrobial Activity, Anti-Inflammatory.[6]The Knoop and Vicker's Microhardness tester are in charge of determining the hardness of the dentin. Microhardness is affected due to surface changes and alteration in composition of tooth structure.[7]

Chemical irrigants can modify the ratio of inorganic and organic contents, which can influence the physical characteristics of dentin namely; microhardness, permeability and solubility. Microhardness is seen as a subliminal indicator of mineral composition alteration in dentin, which may have an impact on the surface's ability to adhere.[8]

The agents interact with the calcium ions in the hydroxyapatite crystals in the specific instance of root dentin. The Ca:P ratio and the dentine's microstructure may alter during irrigation.[9]

MATERIAL & METHODS

Total of Fifty (50) extracted human permanent maxillary and mandibular; single rooted teeth were selected and arbitrarily allocated to 5 groups corresponding to the irrigating solutions and than root canals were prepared and dentin microhardness was evaluated.

Inclusion Criteria

- Single rooted human premolar teeth
- Single canal

Exclusion Criteria

- Fractured
- Grossly decayed
- Resorption
- Dilacerations
- Cracks

Methodology -

All the specimens were then arbitrarily divided into 5 groups (n=10) each; 1 control group and 4 experimental groups. Group I- Saline group, Group II- Neem, Group III- Chlorhexidine, Group IV- Tulsi leaves with rose water extract and Group V- Sodium Hypochlorite. The teeth were stored in Hydrogen peroxide for a week and then in normal saline until further use. To ensure standardization of 15 mm, the teeth were decoronated at the cemento-enamel junction using low speed diamond points and under copious water irrigation to prevent overheating.

Access opening was done and working length was determined by introducing 10 K-file into the canal and each canal was prepared till the working length with the S One blue flex NiTi rotary system up to size 25 (6%) taper. The canals were then irrigated between each instrument change to avoid any unwanted changes to the root canal dentin before conducting the study.

Preparation of neem (Azadirachta indica):

Matured Neem leaves were gathered weighing 25grams and were cleaned with distilled water that had been sterilised, and then mixed with 50 mL of 100% ethanol for 1-2 minutes. Filter paper was used to refine the extract. The mixture was put in a bath of water heated to 45 to 50 °C. An airtight container was then used to keep the finished irrigation solution.

Preparation Of Tulsi Leaves With Rose Water Extract:

100 grams of Tulsi leaves were collected and washed with sterilized distilled water and rose water was added to it. The mixture was fermented and distillized at 100 °C. The final solution was used for irrigation.

DETERMINATION OF DENTIN MICROHARDNESS

The teeth were then sectioned longitudinally into two halves and the separated buccal and lingual halves were entrenched in cold cure

acrylic resin, leaving the dentin surface exposed. The dentinal surface was then polished using silicon carbide abrasives to remove any surface irregularities, under distilled water. The sections were than mounted in cold cure acrylic resin block. The sections were subjected to a 100g load for a dwell time of 15s. Three indentations parallel to the margin of the root canal lumen were made in each sample.

Data were analyzed using SPSS version 20.0. One-way ANOVA and Post Hoc Tukey tests were conducted as statistical testing. The P-value with statistical significance was 0.05.

RESULTS

Table 1 shows Vickers microhardness of all groups.

Table 1: Distribution Of Groups According To Vickers Hardness

Groups	Number	Vickers hardness F/d^2		P Value
		Mean	SD	
Saline (Control group)	10	65.26	1.16	≤ 0.05*
Neem (Azadirachta indica)	10	62.02	1.50	
Chlorhexidine	10	60.39	1.72	
Tulsi leaves with rose water extract	10	51.80	1.23	
Sodium hypochlorite	10	48.66	2.59	

Level of Significance P ≤ 0.05, * Significant, ** Non-Significant

Table 2 : Comparison Of Microhardness Value Between All Groups

Groups		P Value
Saline (Control group)	Neem (Azadirachta indica)	≤ 0.05*
	Chlorhexidine	≤ 0.05*
	Tulsi leaves with rose water extract	≤ 0.05*
	Sodium hypochlorite	≤ 0.05*
Neem (Azadirachta indica)	Chlorhexidine	> 0.05**
	Tulsi leaves with rose water extract	≤ 0.05*
	Sodium hypochlorite	≤ 0.05*
Chlorhexidine	Tulsi leaves with rose water extract	≤ 0.05*
	Sodium hypochlorite	≤ 0.05*
Tulsi leaves with rose water extract	Sodium hypochlorite	≤ 0.05*

Level of Significance P ≤ 0.05, * Significant, ** Non-Significant

Statistically significant difference was observed in Vickers hardness value among all groups with highest value in Saline (Control group) followed by Neem (Azadirachta indica), Chlorhexidine, Tulsi leaves with rose water extract and Sodium hypochlorite group.

DISCUSSION

The quality of the instrumentation, irrigation, disinfection, and ultimately the obturation of the root canal system determines the root canal therapy's long-term prognosis. [10] An irrigant, aids in cleansing, shaping and lubricating the canal while endodontic instruments are being utilised; is crucial in root canal therapy. Ledging, canal transportation, insufficient cleaning and disinfection up to the apex, or instrument separation are mishaps that can be avoided by using these remedies concurrently with sequential filing. The use of chelating agents as irrigants has assisted in the opening of calcified and narrow canals for better instrumentation, but it also alters the Ca:P ratio and dentin microstructure, changing the solubility and permeability of the dentin. [11,12] There is evidence that partial depletion of surface Ca++ may affect the binding strength of some adhesive compounds significantly.[13] Teeth with straight canals were collected because they are simple to instrument. The crowns of the chosen teeth were removed to preserve a length of 18mm for each tooth in order to assure uniformity.[14]

A limitation of the present study is that the trials were performed at room temperature. This could be a potential drawback of the current investigation. An initial rinse with 3% NaOCl can modify the microhardness of root dentin, which may aid to the chelating action of the irrigating solutions to be assessed. The contact time of chelator solutions was restricted to 5 minutes by De-Deus et al (2006), who claimed that this time frame is more practical in terms of clinical practice. When the NaOCl solution's hypochlorous acid comes in contact with organic tissue, it works as a solvent and releases chlorine, inhibiting the activity of bacterial enzymes.[1]

Because of its cationic molecular structure, chlorhexidine exhibits a residual effect. Ferraz et al. showed in a clinical experiment that 2% chlorhexidine improved the cleanliness and smoothness of root canal surfaces, suggesting that it may have some softening effects on root dentin.[3]

An experimental irrigant manufactured from the neem tree, 2.5% sodium hypochlorite, and 0.2% chlorhexidine gluconate were evaluated in 2014 by Dutta et al. for their in vivo antibacterial efficacy. The preoperative and postoperative samples were irrigated with test irrigants before being checked for colony forming units. Neem may be employed in endodontic operations because of its potent anti-microbial properties.[5]

Due to its appropriateness and practicability for evaluation of surface changes happening in the deeper oral hard tissues, the Vicker's microhardness tester was considered instead of the Knoop hardness test in the current investigation. Because it provides reliable measurements and uses a single form of indentation for all surface treatments, this test is also well-liked due of its simplicity.[15,16]

Microhardness is measured as a material's resistance to being penetrated by an indenter that is harder than the standard being tested. These tests produce numerical results that are dependent on a number of variables, including a material's Young's modulus or the yield stress while compression. Due to their intrinsic qualities, including their ease of availability, cost-friendly, longer shelf life and low toxicity; natural products are receiving more attention in studies on root canal disinfection.[17]

CONCLUSION

Within the limitations of the current study it was concluded that CHX (Chlorhexidine) minimally alters the microhardness of root canal dentin surface followed by Tulsi leaves with rose water extract and Sodium hypochlorite respectively which was statistically significant.

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