

Evaluation of Tetracycline Hydrochloride and Chlorhexidine Gluconate in Intracan Smear Layer Removal – A Comparative in Vitro S.E.M Study¹Subin Bharath, Consultant, Endodontist and Restorative Dentist²Noushad M C, Prof & Hod, Dept of Conservative Dentistry and Endodontics, Kannur Dental College³Kavya Maheesan, Senior Lecturer, Dept of Conservative Dentistry and Endodontics, Kannur Dental College⁴Anish Sebastian, Professor, Dept of Conservative Dentistry and Endodontics, Kannur Dental College**Corresponding Author:** Kavya Maheesan, Senior Lecturer, Dept of Conservative Dentistry And Endodontics, Kannur Dental College**Citation of this Article:** Subin Bharth, Noushad M C, Kavya Maheesan, Anish Sebastian, “Evaluation of Tetracycline Hydrochloride and Chlorhexidine Gluconate in Intracan Smear Layer Removal – A Comparative in Vitro S.E.M Study”, IJDSIR- February - 2021, Vol. – 4, Issue - 1, P. No. 264 – 268.**Copyright:** © 2021, Kavya Maheesan, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License. Which allows others to remix, tweak, and build upon the work non commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.**Type of Publication:** Original Research Article**Conflicts of Interest:** Nil**Abstract**

Biologically, smear layer has been considered to be an avenue for leakage. The aim of this study is to evaluate with the aid of scanning electron microscope the efficacy of Tetracycline Hydrochloride and Chlorhexidine Gluconate on the removal of intra canal smear layer, compared to Bidistilled water and Sodium Hypochlorite intra group and inter group comparison was done after SEM analysis. Tetracycline HCl and NaOCl removed smear layer better than Chlorhexidine Gluconate and NaOCl. Chlorhexidine Gluconate and NaOCl is better in smear layer removal than NaOCl used alone.

Keywords: Smear Layer, S.E.M Study, Tetracycline Hydrochloride, Chlorhexidine Gluconate.**Introduction**

Smear layer is a combination of organic and inorganic debris on the canal walls following instrumentation². The

inorganic materials in the smear layer are made up of tooth structure and some nonspecific inorganic contaminants. The organic components may consist of heated coagulated proteins, gelatin formed by the deterioration of collagen heated by cutting temperatures, necrotic or viable pulp tissue and odontoblastic processes plus saliva, blood cells and microorganisms.

Obturing the canal wall with smear layer must be considered a weak union because the smear layer can be torn away from the underlying matrix⁴. Biologically, smear layer has been considered to be an avenue for leakage. Also viable bacteria may use smear layer for their sustained growth and activity. Similarly the smear layer may delay the action of disinfectants on the bacteria harboured in the dentinal tubules. In endodontics, once the smear layer is removed, a better adaptation of obturating materials and sealers become possible. Dentin

permeation by diffusion is increased to five to six times and by convection 25 to 36 times.

Aims and Objectives

The aim of this study is to evaluate with the aid of scanning electron microscope the efficacy of Tetracycline Hydrochloride and Chlorhexidine Gluconate on the removal of intra canal smear layer, compared to Bid stiller water and Sodium Hypochlorite ¹.

This in vitro study was done to compare the efficiency of smear layer removal by three root canal irrigant The irrigants used were 1%Tetracycline hydrochloride, 0.2% Chlorhexidine gluconate and 2.5% Sodium hypochlorite.

Materials Used For the Study

- 1% Tetracycline Hydrochloride solution was prepared by dissolving 250 mg of Tetracycline Hydrochloride powder from tetracycline HCL capsule in 25 ml of distilled water.
- 0.2% Chlorhexidine Gluconate mouthwash
- 2.5% Sodium Hypochlorite
- Bidistilled Water – prepared by bidistillation

Grouping Of Teeth

Group 1 Bidistilled water

Group 2 2.5% NaOCl

Group 3 1 %Tetracycline HCl and 2.5%NaOCl

Group 4 0.2 %Chlorhexidine and 2.5%NaOCl

Preparation of Specimen

In all groups, the split root halves were placed in separate 20 ml vials containing the corresponding irrigant and treated under constant agitation by shaking. The specimens were treated with bidistilled water in group 1 and with 2.5% NaOCl in group 2 for 2 minutes and the solution were changed after the first minute. Group 3 was treated with 1% tetracycline HCL and group 4 was treated with 0.2% Chlorhexidine gluconate for 1 minute and then with 2.5% NaOCl for another minute.Finally the

specimens in all groups were rinsed with bidistilled water for one minute.

Preparation of Specimens for Sem Analysis

All the specimens were fixed in 3% gluteraldehyde for 12 hours at 4°C. Then the specimens are dehydrated in graded alcohol series starting from 30% to 100%. Then the specimens were put in isoamyl acetate for 20 minutes. The specimens were then dried using a critical point dryer. Then the specimens were fixed on an Aluminium stub for gold ion sputtering and later viewed under scanning electron microscope and photomicrographs taken and compared.

RESULTS

Group 1: Specimens irrigated with Bidistilled water

Group 2: Specimens irrigated with 2.5% NaOCl.

Group 3: Specimens irrigated with 1% Tetracycline HCl & 2.5%NaOCl.

Group 4: Specimens irrigated with 0.2% Chlorhexidine gluconate & 2% NaOCl.

The photomicrographs were evaluated according to the following rating system.

Score 0 - No smear layer, Dentinal tubules open free of debris.

Score 1 - Moderate smear layer, outlines of dentinal tubules visible or partially filled with debris.

Score 2 - Heavy smear layer, at lines of dentinal tubules obliterated and not visible.

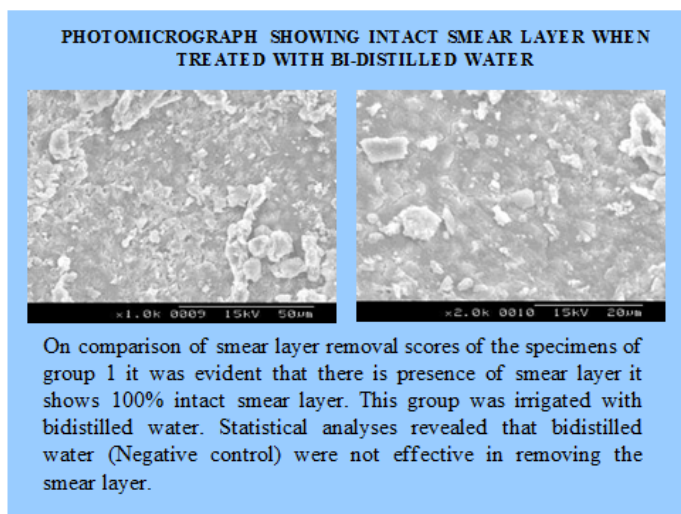


Figure 1

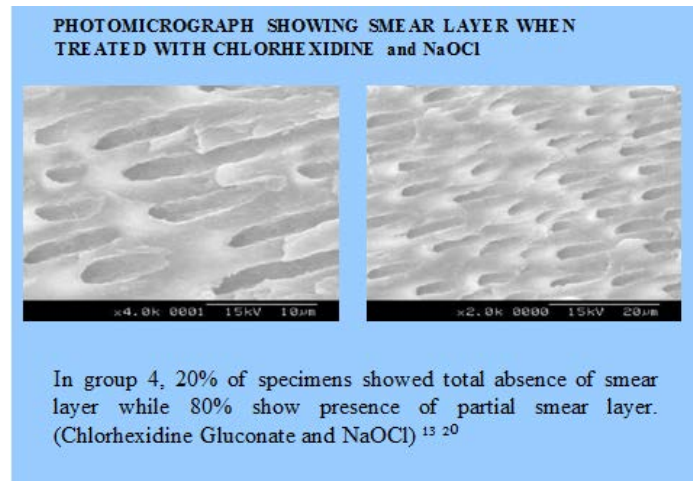


Figure 4

Intergroup Comparison with Mann – Whitney U Test

When comparing 2.5 % NaOCl alone and 1% Tetracycline and 2.5 % NaOCl alternatively shows a very significant probable value of .001 and the mean value of tetracycline HCl and NaOCl alternatively is .3000. The mean value of NaOCl alone is 1.3000. When comparing 1 % Tetracycline HCl and 2.5% NaOCl (Group -3) alternatively and 0.2% Chlorhexidine gluconate, and NaOCl (Group -4) alternatively show a significant probable value of 0.04. The mean value of Group- 3 is .3000. The mean value of, Group - 4 is .8000. From these values it can be inferred that 1%Tetracycline HCl and 2.5% NaOCl used alternatively is the better irrigant between the two for smear layer removal.

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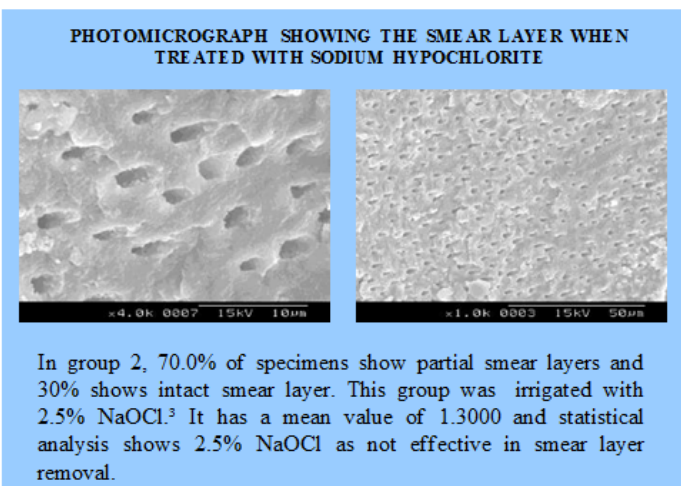


Figure 2

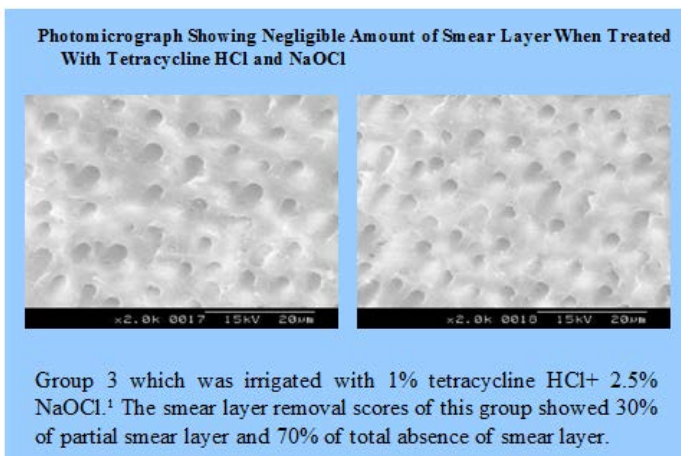
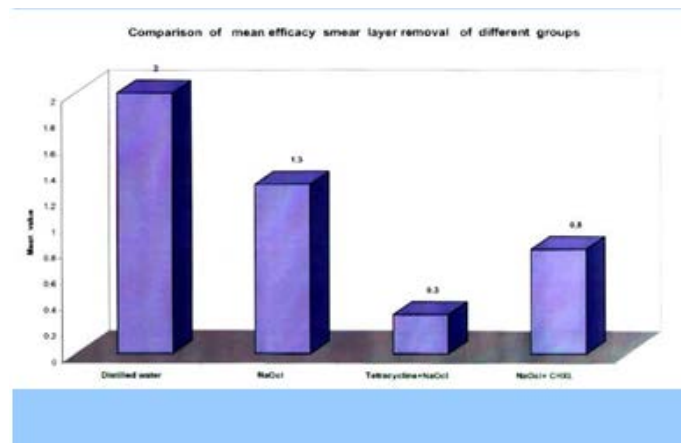


Figure 3

values it can be inferred that 1%Tetracycline HCl and 2.5% NaOCl use alternatively is the better irrigant between the two for smear layer removal.



Discussion

Root canal preparation has two objectives; thorough debridement of the root canal system and the shaping of the root canal preparation to receive specific type of filling. The ultimate objective, however, should be to create an environment in which the body's immune system can produce healing of the apical periodontal attachment apparatus. The first objective is achieved by a skillful instrumentation coupled with liberal irrigation. This double pronged attack will eliminate most of the bacterial contaminants of the canal as well as necrotic debris and dentin. In group 1 where Bidistilled Water was used as irrigant, the dentinal tubules were completely covered by smear layer. Typical amorphous granular appearance of smear layer could be seen on the photomicrograph. In group 2, 2.5% NaOCl was used as an irrigant. This irrigant used alone was unable to produce a smear layer free surface, in agreement with the results of many other investigators. The photomicrographs of this group revealed that dentinal tubules are covered with smear layer. In group 3, 1% Tetracycline HCl and 2.5% NaOCl were used. It showed that Tetracycline Hydrochloride solution is an effective irrigant for smear layer removal. When photomicrograph of specimens

treated with this irrigant was evaluated the surface showed that the smear layer is completely removed, and the dentinal tubule apertures are slightly enlarged. In group 4, 0.2% Chlorhexidine Gluconate and 2.5% NaOCl was used alternatively. It showed that in this group, the canal wall contained less amount of smear layer and dentinal tubule opening was evident but it was not as clean as in group 3 but far better than in group.

Conclusion

According to the finding and within the limitations of this study, it can be concluded that

- There was a significant difference in smear layer removal by Bidistilled water, NaOCl, Tetracycline HCl and Chlorhexidine Gluconate.
- Bidistilled water and 2.5% NaOCl, when used alone during and after instrumentation were found to be ineffective on smear layer removal.
- Tetracycline HCl and NaOCl removed smear layer better than Chlorhexidine Gluconate and NaOCl.
- Chlorhexidine Gluconate and NaOCl is better in smear layer removal than NaOCl used alone.

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