



Journal of Conservative Dentistry

ISSN : 0972 - 0707

VOL : 9 No. 1 Jan - March 2006



An official Publication of
FEDERATION OF
OPERATIVE DENTISTRY
(INDIA)

Comparison of sodium hypochlorite and edta irrigants with an indigenous solution as an alternative to mtad

- AN IN- VITRO STUDY



Dr.Mamatha Y *
Dr.Suma Ballal **
Dr.Gopikrishna V **
Dr.Kandaswamy D ***

* PG Student
** Reader
*** Prof & Head

Department of Conservative Dentistry & Endodontics, Meenakshi Ammal Dental College, Chennai.

ABSTRACT

The concept of smear layer removal prior to obturation has gained importance in recent times. The efficiency of sodium hypochlorite and EDTA in removing the smear layer has been extensively studied. Yet, the perfect solution for root canal debridement is still elusive. This study aims at comparing the extent of smear layer removal by sodium hypochlorite, EDTA and an indigenously developed irrigant using Doxycycline, Citric acid and Tween 80.

The non-availability of MTAD in India at present has made us to find out an indigenous mixture with sodium hypochlorite, citric acid and Tween 80, the detergent. The success of this indigenous irrigant would make it an effective and a cost effective alternative to MTAD.

KEY WORDS : Indigenous mixture, Smear layer, MTAD

INTRODUCTION

The success or failure of root canal therapy depends upon the ability to remove all or most of the debris in the canal during instrumentation¹. Microscopic examination of the root canals reveals irregular and complex systems, with many cul-de-sacs, fins and lateral canals. Additionally, numerous dentinal tubules open onto the root canal surface. The microorganisms present in the root canal not only invade the anatomic irregularities of the system, but also the dentinal tubules and can reinfect the root canals if they remain viable after adequate root canal treatment².

One of the main objectives of root canal therapy is the removal of the diseased tissue, the elimination of microorganisms and smear layer present in the root canal and the dentinal tubules³.

Many newer instrumentation techniques have been proposed to shape the root canal, but these instrumentation procedures produce smear layer on the surface during shaping. Smear layer consists of organic and inorganic substances including fragments of odontoblastic processes, microorganisms and necrotic materials⁴. The presence of this smear layer prevents the complete adaptation of the obturating material to the root canal surface. Hence the removal of smear layer in obturating the root canal system in three dimensions to prevent reinfection.

Root canal irrigant aids in canal debridement and according to Ingle⁵, an endodontic irrigant needs to have certain properties like antimicrobial activity, dissolution of organic tissue and smear layer, aid in debridement of the root canal space, be non-toxic to the periapical tissues and provide lubrication. Conventional irrigants like sodium hypochlorite, EDTA and chlorhexidine which are used in regular practice do not satisfy all the properties of an ideal irrigant.

Recent studies by Torabinejad et al⁶ have proved that MTAD, a mixture of tetracycline isomer, acid and detergent to be an effective root canal irrigant. This is commercially available as Bio-pure MTAD (Tulsa).

As of now, MTAD is not commercially available in India and hence we have attempted at preparing an indigenous irrigating solution as an alternative to MTAD.

AIM

The purpose of this study was to evaluate the effect of an indigenous mixture alternative to MTAD as a root canal irrigant on the removal of debris and smear layer from instrumented root canals, and compare it with sodium hypochlorite and EDTA.

MATERIAL AND METHOD

Thirty extracted maxillary and mandibular single rooted non carious human teeth were used for this study. The teeth were randomly divided into 3 groups of 10 teeth each according to the type of irrigants used during instrumentation.

After preparing a conventional access preparation for each tooth, a K-type file (size 10 or 15) was used to determine the working length. The apical foramen of each tooth was enlarged to a size 40 file. Each canal was instrumented with step back procedure. During instrumentation each canal was irrigated with the following solutions :

1. Sterile distilled water
2. 5.25% Sodium hypochlorite and 17% EDTA
3. Indigenous mixture prepared

After instrumentation each canal was initially irrigated with 1 ml of the respective solution. To ensure a uniform and direct contact of each irrigant with the root canal walls, a size 15 barbed broach was wrapped with cotton and soaked with one of the solutions and placed to the working length. After 4min, the wrapped broached was moved up and down 4 to 5 times, and then each canal was irrigated with 4ml of the solution as a final rinse. The total exposure time to the final solution was approximately 5min. The canals were then irrigated with 10 ml of sterile distilled water and dried with paper points. The teeth were split longitudinally and each half of the tooth was prepared for Scanning Electron Microscope analysis. The specimens were then viewed under the SEM and photomicrographs were taken at a magnification of 5000X at coronal, middle and apical third of the root canal surface.

The Specimens were coded based on the irrigating solution used. In a blind manner, two investigators scored the presence or absence of smear layer on the surface of the root canal or in the dentinal tubules at the coronal, middle and apical portion of each canal according to the following criteria⁷.

- 1 No smear layer. No smear layer on the surface of the root canal; all the tubules were clean and open.
- 2 Moderate smear layer. No smear layer on the surface of the root canal, but tubules contained debris.
- 3 Heavy smear layer. Smear layer covered the root canal surface and the tubules.

Tukey's multiple comparison test method was used to analyze the data.

RESULTS

At the coronal third, removal of the smear layer revealed the presence of more abundant and larger dentinal tubules in root canals treated with indigenous mixture (Fig. 1) as well as sodium hypochlorite and EDTA combination (Fig.2).

At the middle third, the indigenous mixture (Fig. 4) as well as sodium hypochlorite and EDTA combination (Fig.5) removed the smear layer but to a lesser extent than the coronal third.

At the apical third, maximum amount of smear layer was removed with only the indigenous mixture (Fig.7). With sodium hypochlorite and EDTA combination (Fig.8), smear layer removal at the apical third was not effective. However, with distilled water, heavy smear layer was observed at the coronal, middle and apical thirds (Fig.3, Fig.6, Fig.9).

Comparison of the three treatment groups (Fig.10) showed a statistically significant difference in the amount of the debris remaining mainly at the apical portion of the root canal ($p < 0.001$).

No statistically significant difference was found between the coronal and middle thirds of the root canals treated with indigenous mixture and sodium hypochlorite and EDTA combination ($p = 1$).

DISCUSSION

Chemo-mechanical cleaning and shaping of the root canal system removes a great deal of irritants, but total debridement is impeded because of the complexity of the root canal system. Due to diverse ramifications of apical pulp space anatomy, many regions are inaccessible to conventional debridement methods. The main purpose of the study was to evaluate the

effectiveness of an indigenous irrigant solution with ingredients capable of disinfecting dentin, removing smear layer, opening dentinal tubules and allowing the antibacterial agents to penetrate the entire root canal system especially the apical third.

In this indigenous solution, disinfection of the internal root surface is due to the presence of the anti bacterial effect of Doxycycline, its ability to remove organic and inorganic substances from the surfaces of roots, which is facilitated by the presence of citric acid and the presence of detergent that aids its propensity to diffuse into the root canal and the dentinal tubules. Reduction of the surface tension by the detergents has been shown to improve the antimicrobial properties of medications used in the root canal⁸.

This indigenous solution was prepared with 0.05% Doxycycline⁹, 10% Citric acid¹⁰, and 10% Tween 80¹¹ at a ratio of 2:2:1. This ratio of 2:2:1 has been chosen depending on the importance of the role played by each ingredient. The above mentioned concentrations have also been selected on the basis of earlier studies.

Our study has proved the indigenous solution to be effective in smear layer removal and thereby facilitating better penetration of the sealer and a complete obturation. This preparation is not only easy to prepare but also economical. It is cost effective being a chair side preparation and can also be used in day to day practice as an effective root canal irrigant.

CONCLUSION

Based on the results of this study, it appears that this indigenous mixture is an effective canal irrigant not only at the coronal and middle thirds of the root but also at the most important apical third of the root canal system.

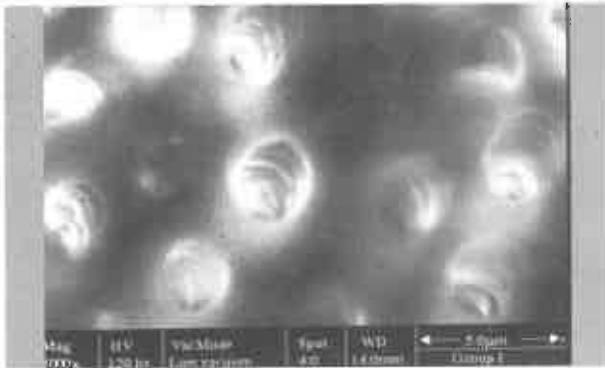


Fig.1

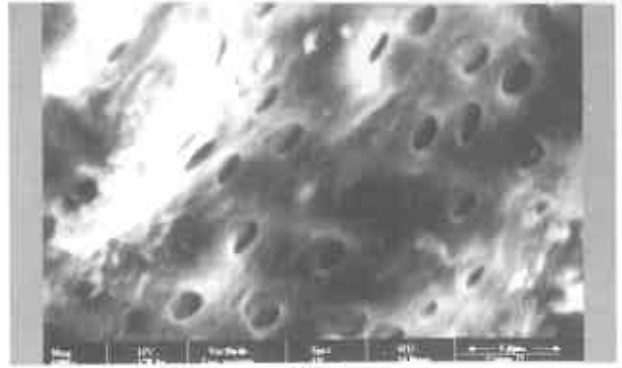


Fig.2

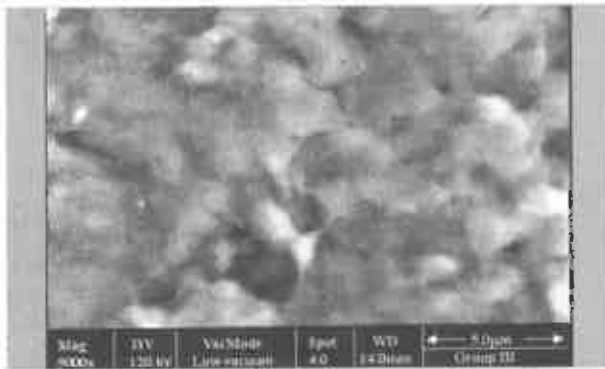


Fig.3

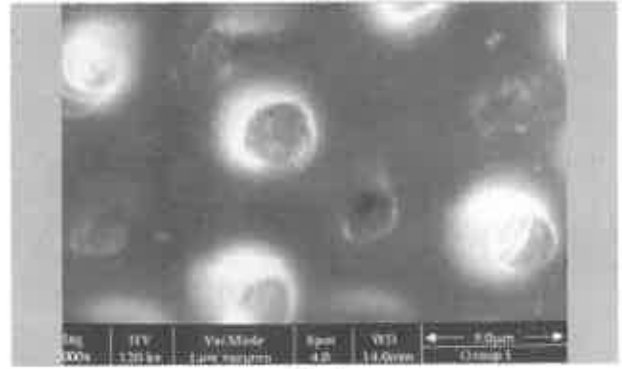


Fig.4

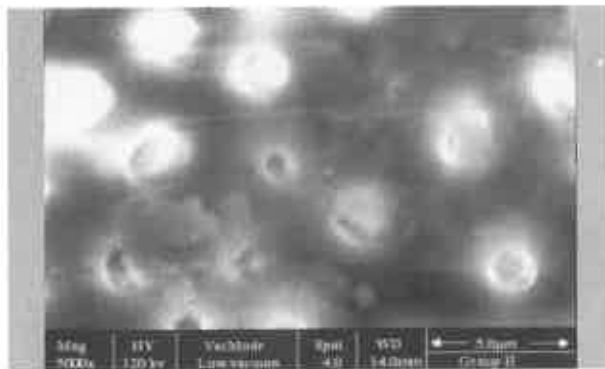


Fig.5

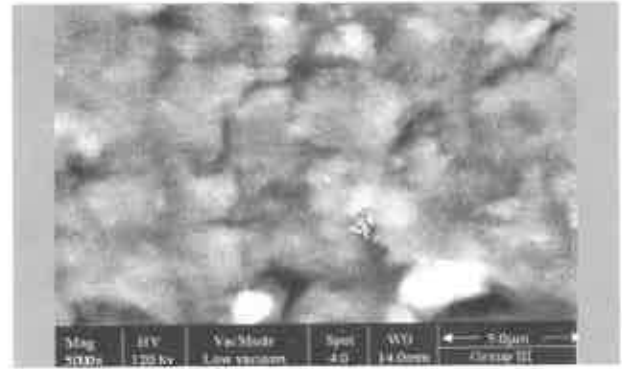


Fig.6



Fig.7

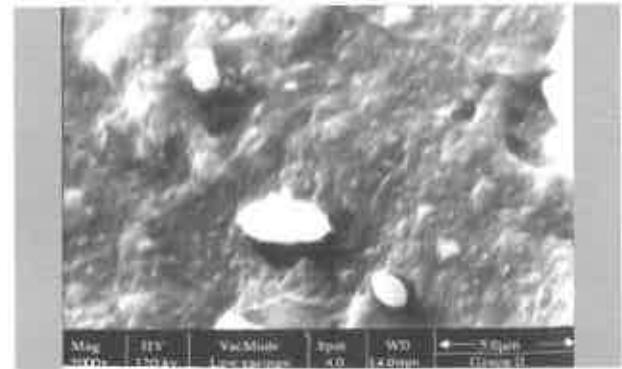


Fig.8

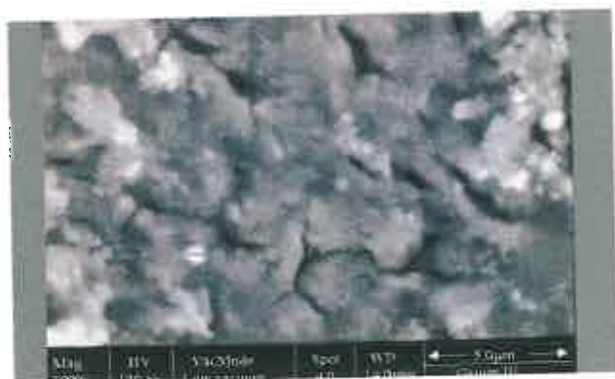


Fig.9

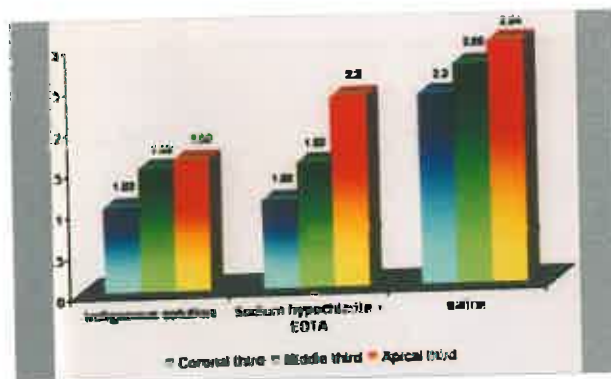


Fig.10

REFERENCES

- Garberoglio R, Becce C. Smear layer removal by root canal irrigants. A comparative scanning electron microscope study. *Oral Surg Oral Oral Pathol* 1994;78:59-67.
- Orstavik D, Haappasola M. Disinfection by endodontic irrigants and dressings of experimentally infected dentinal tubules. *Endod Dent Traumatol* 1990;6: 142-9.
- Anto N, Hoshino E. Predominate obligate anaerobes invading the deep layers of root canal dentine. *Int Endod J* 1990;23: 127-30.
- Mahmoud Torabinejad, Robert Handysides. *Oral Surg Oral Med Oral Pathol* 2002; 94: 658-665.
- John I Ingle, Bakland. *Endodontics*; 5th Ed: Pg 498.
- Mahmoud Torabinejad, Abbas Ali Khademi. An in vitro anti microbial efficacy of MTAD and sodium hypochlorite. *J. Endod* 2003; 29(7); 45002.
- Mahmoud Torabinejad, Abbas Ali Khademi. A new solution for removal of smear layer. *J. Endod* 2003; 29(3): 170-5.
- Mahmoud Torabinejad, Abbas Ali Khademi. A new solution for removal of smear layer. *J. Endod* 2003; 29: 170-5.
- Katherine R. Carson, Gary G. Goodell. Comparison of the antimicrobial activity of six irrigants on primary endodontic pathogens. *J Endod* 2005;31(6): 471-3.
- Blake E. Wayman, William M. Kopp. *J Endod* 1979;5(9); 258-264.
- Mahmoud Torabinejad, Abbas Ali Khademi. A new solution for removal of smear layer. *J. Endod* 2003; 29(3); 170-5.