

Original Research

Antibacterial efficiency of Qmix in root canal system- An invitro study

¹Dr. Neha Singh, ²Dr. Dipshi Ranjan, ³Dr. Ishika Rastogi, ⁴Dr. Priya Mishra, ⁵Dr. Akhil Mudgal, ⁶Dr. Ajay Kumar Nagpal

¹⁻⁵Postgraduate, ⁶Professor and Head, Dept. of Conservative Dentistry and Endodontics, K.D Dental College, Mathura, Uttar Pradesh, India

ABSTRACT:

Background: Successful root canal treatment is aimed for complete removal of microorganisms by meticulous chemomechanical preparation followed by three-dimensional sealing of the endodontic system. The present study was conducted to assess antibacterial efficiency of Qmix in root canal system. **Materials & Methods:** 45 recently extracted mandibular teeth were sectioned upto the level of cervical margin and washed with the solution of sodium hypochlorite. Access opening and biomechanical preparation was performed. Samples were divided into 3 groups of 15 each. In group I, Qmix irrigating solution was used. In groups II, sodium hypochlorite irrigant was used and in group III no irrigation was done. **Results:** Group I had 8%, group II 22% and group III 92% colonies of E. Faecalis. The difference was significant (P< 0.05). **Conclusion:** Smear layer was efficiently removed and level of E. Faecalis was decreased with Qmix in comparison to sodium hypochlorite.

Key words: E. Faecalis, QMix, Sodium hypochlorite

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Corresponding author: Dr. Neha Singh, Postgraduate, Dept. of Conservative Dentistry and Endodontics, K.D Dental College, Mathura, Uttar Pradesh, India

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INTRODUCTION

Successful root canal treatment is aimed for complete removal of microorganisms by meticulous chemomechanical preparation followed by three-dimensional sealing of the endodontic system.¹ Chemomechanical preparation includes shaping by mechanical removal of dentin and cleaning by chemical dissolution of organic tissues and disinfection of microorganisms. However, shaping of the root canal can be well achieved by instrumentation but effective cleaning of the entire root canal system remains a challenge. Mechanical preparation inadvertently forms an amorphous layer termed as "smear layer" on the root canal walls which contains microorganisms too.²

Root canal treatment failure comprises a variety of reasons and persistence of microorganisms in the root canal system even after shaping and cleaning is one of them. The primary objective of the root canal therapy revolves around thorough debridement. However, due to the complexity of the root canal system, shaping and cleaning procedure has become a challenging

phase for the clinician.³ The disinfection of the entire root canal system relies on the ability of chemical irrigants in the root canal system. Smear layer forms on the inner root canal wall when it is in contact with the instruments and during filing motion. It comprises 2 parts, the thick superficial layer on the surface of root canal wall (approximately 1 to 2 μ m) and a deeper layer (up to 40 μ m) into the dentinal tubules which contain organic and inorganic tissues including microorganisms and necrotic debris.⁴

The irrigants that are currently used during cleaning and shaping include sodium hypochlorite (NaOCl), chlorhexidine, ethylene diamine tetra acetic acid (EDTA), mixture of tetracycline, an acid and detergent (MTAD).⁵ Qmix irrigating solution is a single solution used as final rinse after bleach for one-step smear layer removal and disinfection. Its nonantibiotic, premixed formula provides a "best practice" irrigation protocol in fewer steps for proven and effective irrigation made easy.⁶ The present study was conducted to assess antibacterial efficiency of Qmix in root canal system.

MATERIALS & METHODS

The present study consisted of 45 recently extracted mandibular teeth of both genders. All subjects were informed regarding the study and their written consent was obtained.

The study was approved form higher authorities. Selected teeth were sectioned upto the level of cervical margin and washed with the solution of sodium hypochlorite. Access opening and biomechanical preparation was performed. Samples were divided into 3 groups of 15 each. In group I,

Qmix irrigating solution was used. In groups II, sodium hypochlorite irrigant was used and in group III no irrigation was done. After irrigation the teeth were placed in vials, which contained 2 mL of the nutrient broth. The vials were incubated at 37°C for 24 hours. The vials were checked for turbidity after 24 hours incubation. 6 mL of broth from all the samples together was collected and seeded on a Petri dish containing UTI Hichrome agar in order to count the CFUs. Results were statistically analysed. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of teeth

Groups	Group I	Group II	Group III
Solution	Qmix	Sodium hypochlorite	No irrigation
Number of teeth	15	15	15

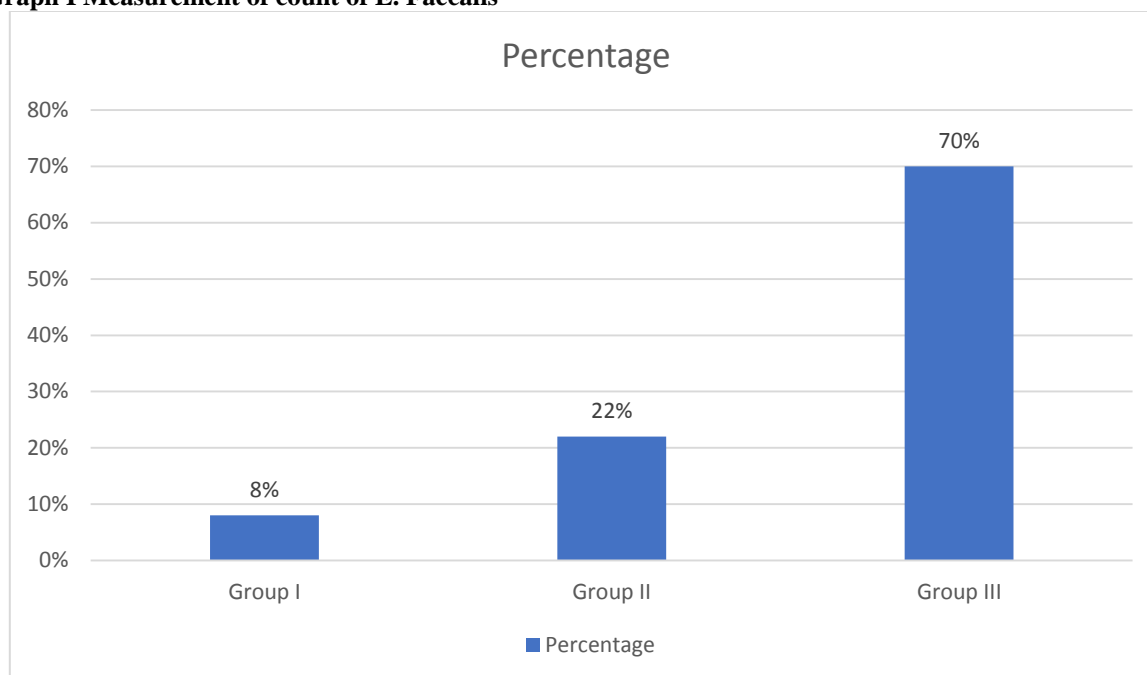
Table I shows distribution of teeth based on irrigation solutions used. Each group comprised of 15 teeth.

Table II Measurement of count of E. Faecalis

Groups	Percentage	P value
Group I	8%	0.01
Group II	22%	
Group III	70%	

Table II, graph I shows that group I had 8%, group II 22% and group III 92% colonies of E. Faecalis. The difference was significant (P< 0.05).

Graph I Measurement of count of E. Faecalis



DISCUSSION

Successful root canal treatment is aimed for complete removal of microorganisms by meticulous chemomechanical preparation followed by three-dimensional sealing of the endodontic system.⁷ Chemomechanical preparation includes shaping by mechanical removal of dentin and cleaning by chemical dissolution of organic tissues and disinfection of microorganisms.⁸ However, shaping of

the root canal can be well achieved by instrumentation but effective cleaning of the entire root canal system remains a challenge. Mechanical preparation inadvertently forms an amorphous layer termed as “smear layer” on the root canal walls which contains microorganisms too.⁹ The present study was conducted to assessed antibacterial efficiency of Qmix in root canal system.

In our study, samples were divided into 3 groups of 15 each. In group I, Qmix irrigating solution was used. In groups II, sodium hypochlorite irrigant was used and in group III no irrigation was done. Jagzap et al¹⁰ evaluated and compared smear layer removing ability among 17% ethylenediaminetetraacetic acid (EDTA), Q-MIX, and phytic acid by scanning electron microscopy (SEM). This in-vitro experimental study assessed smear layer removal using three different irrigants. Thirty single-rooted freshly extracted human permanent premolars were collected, disinfected, and decoronated to a standardized root length of 13 mm. Root canals were cleaned and shaped till F2 universal rotary protaper at working length 1 mm short of the apex. They were randomly divided into three groups, and final irrigation was done accordingly. Group 1 ($n = 10$): with 1 ml of 17% EDTA, Group 2 ($n = 10$): with 1 ml of Q-MIX, Group 3 ($n = 10$): with 1 ml of phytic acid. Samples were then longitudinally sectioned and evaluated under SEM at coronal, middle, and apical levels. Smear layer removing ability among irrigants and sections in descending order: 17 EDTA > Q-MIX > phytic acid; coronal > middle > apical. 17% EDTA showed better and promising results followed by Q-MIX and then phytic acid.

We observed that group I had 8%, group II 22% and group III 92% colonies of *E. Faecalis*. Stojicic et al¹¹ reported that QMix effectively killed *E. faecalis* biofilms grown on collagen-coated hydroxyapatite discs in vitro, and was superior to CHX and MTAD. QMix was known for its single irrigant that has both antibacterial and smear layer removal properties. Few studies showed that 5% to 6% NaOCl was more effective than QMix against *E. faecalis* biofilm when 1 mL was used for 1 and 3 minutes. QMix showed better antibacterial property compared to NaOCl, when it was employed for longer exposure time and at higher volume.

Dai et al¹² examined the ability of two versions of QMix, an experimental antimicrobial irrigant, on removal of canal wall smear layers and debris using an open canal design. Cleaned and shaped single-rooted human root canals were irrigated with NaOCl as the initial irrigant and one of the following as the final irrigant: (1) QMix I (pH = 8), (2) QMix II (pH = 7.5), (3) distilled water, (4) 17% EDTA, and (5) BioPure MTAD. Smear and debris scores were evaluated in the coronal, middle, and apical thirds of longitudinally fractured canal spaces using scanning electron microscopy. Smear scores, when the overall canal was considered, differences were observed among groups except groups 1 versus 4 and groups 2 versus 4. After adjusting for canal levels, all groups differed significantly from each other ($p < 0.005$) with the exception of groups 2 versus 5. For the debris scores, no significant difference was observed among the treatment groups when the overall canal was considered and after adjusting for the effect of canal level.

CONCLUSION

Authors found that smear layer was efficiently removed and level of *E. Faecalis* was decreased with Qmix in comparison to sodium hypochlorite.

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