

I- Effectiveness of a Novel All-in-One Dual-Action Endodontic Irrigating Solution

- a. Aim
 - i. The aim of the study was to evaluate the effectiveness of a novel all-in-one, dual-action endodontic irrigating solution (Triton; Vista-Dental, Racine, US) on smear layer and debris removal, tissue dissolution, antimicrobial efficacy and chlorine stability.
- b. Methods
 - i. Smear layer and debris removal was evaluated in 30 extracted single-rooted teeth comparing Triton with 6% NaOCl (C1) and 6% NaOCl/17% EDTA as a final rinse (C2). SEM analysis was used to determine the amount of smear layer and debris remaining. Tissue dissolution was evaluated by placing a $0.5g \pm 0.05g$ tissue sample in 20mL of 6% NaOCl, Q-Mix and Triton and measuring the tissue remaining after 30 minutes. Antimicrobial efficacy was evaluated by zone of inhibition testing against *Staphylococcus aureus* and *Pseudomonas aeruginosa* for 6% NaOCl, Q-Mix and Triton. Chlorine stability of Triton was evaluated by iodometric titration at 0, 15, 30, 60, 90 minutes and 6 hours. Data was statistically analyzed with a level of significance of $P < 0.05$.
- c. Results & Conclusions
 - i. Triton was statistically more effective than C1 and C2 in removing smear layer and debris from all root canal thirds ($P < 0.05$). No significant difference was found between Triton and 6% NaOCl for tissue dissolution and antimicrobial testing. Triton was statistically significantly more effective at dissolving tissue and killing bacteria than Q-Mix. After six hours Triton still had an effective concentration of NaOCl ($\geq 2.0\%$).
- d. Clinical Impact
 - i. Triton was found to be more effective than conventional irrigants to remove smear layer and debris and performed equivalent to 6% NaOCl for tissue dissolution and antimicrobial testing.
- e. Citation
 - i. G. Plotino. OR42. AAE 2020 Annual Meeting.
 - ii. Manuscript pending submission to JOE.

II- Antimicrobial Effect of Triton on Mono- and Multispecies Biofilms in Dentin Canals

a. Aim

- i. The aim of the study was to evaluate the effectiveness of a novel all-in-one, dual-action endodontic irrigating solution (Triton; Vista-Dental, Racine, US) on antimicrobial efficacy in the presence of smear layer.

b. Methods

- i. Dentin blocks with *E. faecalis* and pooled supragingival and subgingival dental plaque were created and incubated in an incubator (37°C) for 1 week and 3 weeks to create biofilms. At the end of incubation, dentin blocks are removed, and on a subset of samples, a smear layer is created on the canal side of dentin blocks using a medium-grit cylinder flat-end bur at 1500 rpm for 4 seconds each. 100uL of each solution is added onto the surface of dentin specimens, followed by solution aspiration, a water rinse, and drying using paper points. After exposure to the solutions, the dentin pieces are split from the cemental side along the root canal axis into 2 halves in order to expose a fresh surface of longitudinally fractured dentin tubules. The specimen is then stained with SYTO-9 and propidium iodide and scanned using a confocal laser scanning microscope. For each group, a minimum of 4 dentin pieces are examined with a minimum of 10 scanned stacks using stratified sampling.

c. Results & Conclusions

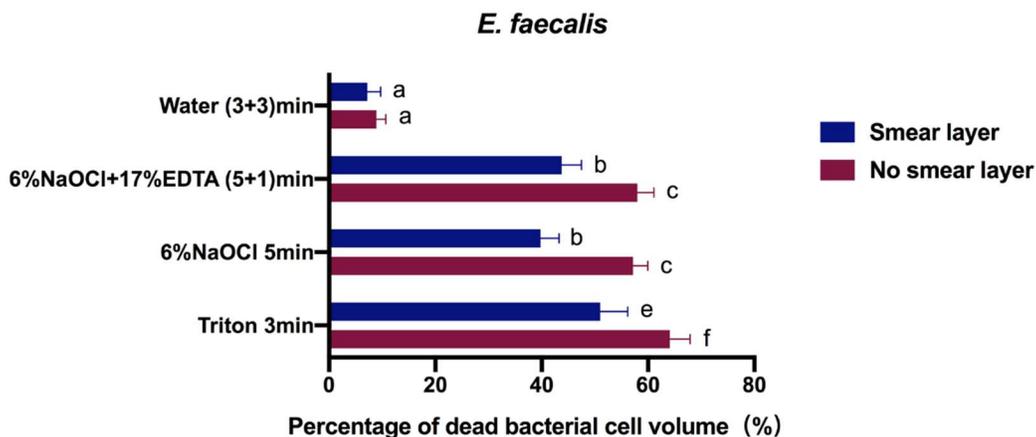
- i. Of the investigated irrigation regimens and solutions, Triton resulted in the greatest dead bacteria in the presence of absence of smear layer in half the irrigation time.

d. Clinical Impact

- i. Triton was found to be more effective than conventional irrigants to remove smear layer and debris and performed equivalent to 6% NaOCl for tissue dissolution and antimicrobial testing.

e. Citation

- i. X. Sheng, Z. Wang, Y. Shen. University of British Columbia, School of Dentistry, Department of Endodontics.
- ii. Manuscript pending submission to JOE.



III- Antimicrobial activity of three different irrigation protocols on *E. faecalis* and *C. Albicans* biofilm in dentin discs.

a. Aim

- i. The aim of this study was to compare the antimicrobial activity of different irrigating solutions on *Enterococcus faecalis* (ATCC 29212) and *Candida albicans* biofilm.

b. Methods

- i. 76 dentin discs were prepared from single-rooted human teeth measuring 3 mm in thickness and 4 mm in diameter. *C. albicans* was cultured at 37°C in a Mueller Hinton Broth for 72h. Dilutions at a final concentration of McFarland 0.5 (1.5×10^8 CFU/mL) were prepared in appropriate culture medium (BHI) used to contaminate samples. The dilutions were incubated at 37°C for 72h. The medium was refreshed every two days. Discs with *C. albicans* biofilm were treated with Sodium Hypochlorite 5.25% and EDTA 17%, Sodium Hypochlorite 5.25%, Dual Rinse® HEDP, Triton or they were not treated. Data were analyzed using one-way ANOVA followed by Dunnett's test.

c. Results & Conclusions

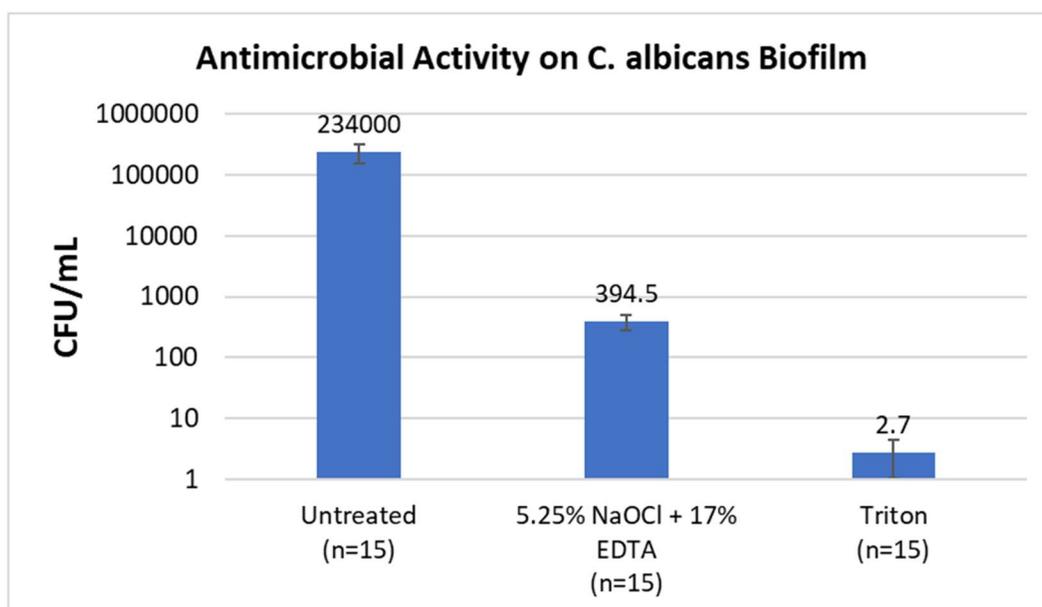
- i. Statistically significant differences were found among all groups ($p < 0.05$). Triton showed the lowest CFU of all irrigants ($p < 0.05$). Sodium Hypochlorite and EDTA had lower antimicrobial activity than Dual Rinse and Sodium Hypochlorite and Triton ($p < 0.05$).

d. Clinical Impact

- i. Triton showed the highest antimicrobial activity of all irrigants investigated.

e. Citation

- i. G. Plotino. Department of Endodontics, Catholic University of Sacred Heart, Rome, Italy.
- ii. Manuscript pending submission to JOE.



IV- Evaluation of the Antimicrobial Effect of a New Endodontic Irrigant (Triton) in the Presence of Dentin

a. Objectives:

- i. To evaluate the antibiofilm efficacy of (Triton) in comparison with 4% NaOCl, 4% NaOCl, 2% CHX, 17% EDTA, and saline on *E.faecalis* biofilms grown in the MBEC high-throughput device in the presence of dentin shavings.

b. Methods

- i. *E. faecalis* biofilms were created in a MBEC high-throughput device via culturing 10^5 bacterium in BHI + 1% glucose for 48 hours with a media change at 24 hours. The biofilms were washed with 0.89% NaCl for two minutes. To investigate the effect of dentin on the antimicrobial properties of the irrigation solutions (Triton, 4% NaOCl, 2% CHX, 17% EDTA, and saline), dental shavings was initially obtained from teeth using a diamond burr and autoclaved for sterility. 20mg of dentin powder was exposed and mixed with 1mL of irrigation solution for 10 minutes, after which 200uL of the solution / dentin mix was applied to the biofilm for 10 seconds. The solution / dentin mix was then removed, and the biofilm was rinsed with 0.89% NaOCl. The irrigant was considered eradicating the biofilms when it produced no visible growth on blood agar.

c. Results & Conclusions

- i. Within the experimental conditions, it was found that the incubation of NaOCl with dentin led to the abolishment of the antimicrobial effect, probably due to the buffering effect of dentin. However, the effect of dentin powder on Triton was less significant as no visible growth was seen on blood agar.

d. Clinical Impact

- i. Triton was the only irrigant able to maintain its efficacy in the presence of dentin.

e. Citation

- i. B. Karabucak and A. Babeer. Department of Endodontics, School of Dental Medicine, University of Pennsylvania.
- ii. Manuscript pending submission to JOE.

Efficacy of Various Irrigants against E. Faecalis Biofilm Under Different Conditions

