بسم الله الرحمن الرحيم

(وَمَا تَوْفِيقِى إِلا بِاللهِ عَلَيْهِ تَوَكَّلْتُ وَإِلَيْهِ أُنِيبُ)

صدق الله العظيم

سورة هود آيه (٨٨)

Effectiveness of various disinfectants, and their combinations used as endodontic intracanal medications

(An *in vitro* study)

Thesis submitted to the Faculty of Oral and Dental Medicine, Cairo University, in the partial fulfillment of the requirements for the Master's Degree in Endodontics

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Dedication

My Father, My Mother,

My brother karem,

My sister Mahy

For their endless love and support

I wish them all the best forever

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Before all and above all thanks to Allah

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ABSTRACT

Abstract

The purpose of this study was to evaluate the antimicrobial efficacy of the following disinfectants and their combinations; $Ca(OH)_2$, doxycycline, NaOCl and CHX, and their effect on the sealing ability after root end resection. 120 extracted, human, single rooted teeth were decoronated and mechanically prepared. After sterilization of the roots, half of them were contaminated with *Enterococcus faecalis* and the other half with *Candida albicans* for 3 days. The roots were classified into five experimental groups according to the type of medicament used and two control groups. The experimental groups were; group 1: $Ca(OH)_2$ paste, group 2: doxycycline paste, group 3: $Ca(OH)_2$ and doxycycline paste, group 4: $Ca(OH)_2$, doxycycline and NaOCl paste, group 5: $Ca(OH)_2$, doxycycline and CHX paste. The medications were left inside the root canals for 3 days. After removal of the medicaments, samples were taken, serially diluted, inoculated on agar plates and incubated for 48 hours at 37 ˚ C. The colony forming units were counted. In the 2nd part of the study, six roots were selected randomly from each experimental group. They were obturated and root ends were resected. The leakage was measured using dye extraction method. The results were statistically analyzed using ANOVA test, *Tukey's post-hoc* test and Student's t-test. Results showed that $Ca(OH)_2$ paste and doxycycline paste were not able to kill *E.faecalis* and *C.albicans* completely after 3 days of exposure. However, doxycycline paste showed significantly higher reduction in *E.faecalis* count than $Ca(OH)_2$ paste while $Ca(OH)_2$ paste showed non significantly higher reduction in *C.albicans* count than doxycycline paste. The $Ca(OH)_2$/ doxycycline

paste killed *E.faecalis* completely but with *C.albicans* they lower their account. The addition of doxycycline and irrigants to $Ca(OH)_2$ increased the antimicrobial effect, even if this was of no statistical significance. $Ca(OH)_2$ paste and doxycycline paste recorded the highest leakage value with no statistical significance difference between them while $Ca(OH)_2$, doxycycline paste showed the lowest leakage values. A combination of two or more disinfecting agents seems to be a valuable option in the battle against maximum amount of microorganisms and the addition of irrigating solutions to the mixture of intracanal medication was found to be a beneficial to improve the antimicrobial effect.

Key words: Intracanal medication, Calcium hydroxide, doxycycline, *E.faecalis*, *C.albicans*, sealing ability.

INTRODUCTION

Introduction

The established role of microorganisms in the pathogenesis of pulp and periradicular diseases has rendered the eradication of bacteria from the root canal system a primary objective of root canal therapy. It has been demonstrated that mechanical instrumentation cannot sufficiently disinfect root canals. Therefore, irrigation solutions and intracanal medication are required to eradicate microorganisms. The ideal irrigant must kill bacteria, dissolve necrotic tissue, lubricate the canal, remove the smear layer, and not irritate healthy tissues. The ideal medicaments must complete the disinfection of the root canal.

However, some cases are resistant to routine therapy and the infection may persist. *Enterococcus faecalis* and *Candida albicans* have been frequently isolated from persistent root canal infection and resist various intracanal irrigants such as sodium hypochlorite (NaOCl) and chlorhexidine (CHX), as well as commonly used intracanal medicament such as calcium hydroxide $Ca(OH)_2$. This may be the reason for a search of another intracanal medicament.

BioPure MTAD (a mixture of tetracycline, citric acid, and detergent) has been shown to be effective against *E.faecalis*. Doxycycline is the primary ingredient contributing to the antibacterial activity of MTAD. In an attempt to gain benefit of the high alkalinity of $Ca(OH)_2$ and the strong antimicrobial activity of doxycycline, this work aims to shed light on the efficacy of different combinations of these agents with endodontic irrigants against resistant microorganisms.

REVIEW OF LITERATURE