HOSTED BY
ELSEVIER
CrossMark
Available online at www.sciencedirect.com
ScienceDirect
Tanta Dental Journal 12 (2015) 41–47
www.elsevier.com/locate/tdj

Antimicrobial effect of different intracanal medications on various microorganisms

D.A. Attia [a,*], A.M. Farag [a], I.K. Afifi [b], A.M. Darrag [a]

[a] *Faculty of Dentistry, Tanta University, Egypt*
[b] *Faculty of Medicine, Tanta University, Egypt*

Received 21 June 2014; revised 24 October 2014; accepted 26 October 2014
Available online 26 January 2015

Abstract

To compare the antimicrobial effect of Calcium hydroxide paste (CaOH), Chlorhexidine gluconate (CHX) gel and Antibiotic-Corticosteroid paste against *Streptococcus mutans*, *Enterococcus faecalis* and *Candida albicans* in root canal lumen and radicular dentin.

Materials and methods: Eighty four single rooted extracted human teeth with straight root canals were selected, decronated leaving root segments of 15 mm length. All canals were prepared up to size 40 master apical file under irrigation with sodium hypochlorite solution. Roots were sterilized, infected by mixed suspension of the three types isolated microorganisms and incubated at 37 °C for 14 days. The roots were divided into 4 equal groups according to the intracanal medications used. Group I: CaOH, Group II: CHX, Group III: Antibiotic-Corticosteroid paste and Group IV: saline. Each main group was further equally subdivided into 3 subgroups according to the isolated organism. Subgroup (A): *S. mutans*, Subgroup (B): *E. faecalis* and Subgroup(C): *C. albicans*. The medicated roots were incubated for 7 days at 37 °C then irrigated to remove the medications. Two samples were taken from each canal, one from root canal lumen and the other from radicular dentin and cultured on three media selective for each tested microorganisms. The growing colonies were counted and recorded as colony forming units CFU.

Results: Chlorhixidine gel showed the best effect against all tested microorganisms at both experimental sites, while Antibiotic-Corticosteroid paste was the worest one.

Conclusion: CHX was the best medication used to eliminate the different tested organisms at the two experimental sites. *S. mutans* was the most sensitive microorganism to the whole tested medications, while *C. albicans* was the most resistant one.

Keywords: Root canal medication; Antimicrobial effect; *Streptococcus mutans*; *Enterococcus faecalis*; *Candida albicans*

1. Introduction

An important and fundamental goal of root canal treatment is to eliminate bacteria from the root canal and prevent reinfection because bacteria or their products are considered to be the primary etiologic factors of periapical lesions and root canal filling

* Corresponding author. Tel.: +20 1220550150.
E-mail addresses: dina_attia2014@yahoo.com (D.A. Attia), dralifarag@yahoo.com (A.M. Farag), adarrag@hotmail.com (A.M. Darrag).

Peer review under the responsibility of the Faculty of Dentistry, Tanta University.

http://dx.doi.org/10.1016/j.tdj.2014.10.005
1687-8574/

failure. Root canal infections have a polymicrobial nature hence, anaerobic and facultative anaerobic microorganisms are usually found together in endodontic flare-ups and cases with post-treatment disease [1].

The ecological selection in the canal favors strictly anaerobic bacteria involving, *Actinomyces, Lactobacillus, Prevotella, Streptococcus* and *Dialister pneumonsintes* [2] which clearly constitute the majority in primary infections with no single species being considered as the main pathogen [3]. However, in previously root-filled teeth with apical periodontitis, the ecology may be quite different, and in many cases the environment no longer supports the dominance of anaerobic bacteria and the most frequently isolated species is *Enterococcus faecalis* [4]. Additionally, yeasts like *Candida albicans* are found almost entirely only in previously root-filled teeth with apical periodontitis [5].

Numerous measures have been described to reduce the numbers of root canal microorganisms, including the use of various instrumentation techniques, irrigation regimens, and intracanal medications [6]. Since the chemomechanical preparation of the root canal reduces endodontic infection, but microorganisms are able to survive within the complex anatomy of the root canal system. So, the antimicrobial intracanal medicaments are used to complement the disinfection of the root canal system [7].

Calcium hydroxide (CaOH) is a drug widely used as an intra-canal dressing between the appointments in an endodontic therapy. Additionally, Chlorhexidine (CHX) is an antiseptic with a broad antimicrobial spectrum and high substantivity. It is commonly used as interappointment root canal medication.

For years, the systemic and topical use of antibiotics has been utilized in dentistry. Chronic alveolar infections are associated with pulpless teeth and lesions that have no blood supply reaching the pulpal space. Therefore, the systemic administration of antibiotic and the negligible concentration reaching the root canal are unlikely to be beneficial. So, topical application of intracanal antibiotic is more recommended as substantially higher concentrations can be utilized [8]. Furthermore corticosteroid-antibiotic combinations have also been used as an intra-canal medicament for its anti-inflammatory action, to relieve pain associated with acute apical periodontitis, and to prevent acute exacerbation of chronic apical periodontitis [9].

The question of the role of intra-canal medicaments becomes more complex in the treatment of apical periodontitis with variable types of microorganisms. So it was necessary to evaluate the antimicrobial effectiveness of different intracanal medications like (Calcium hydroxide, Chlorhexidine gluconate gel and Antibiotic-Corticosteroid pastes) on different microorganisms commonly present in infected root canals including *Streptococcus mutans, E. faecalis* and *C. albicans*.

2. Materials and methods

Eighty four recently extracted intact single rooted human premolars with single straight root canals were selected. The clinical crowns were removed using a water-cooled diamond disk[1] mounted in a low-speed hand piece leaving standardized roots length of approximately 15 mm. Then the roots were stored in a sterile physiologic saline solution at room temperature that is changed daily until use within three months after extraction [10].

The root canals diameter was standardized by selecting all the canals with initial apical file #25. The pulp tissue was removed using a K-hand file[2] and the working length was determined using size 15 K-file. All canals were sequentially prepared using step-back technique up to size # 40 master apical file and flaring the canal was performed up to size #80 under irrigation with 2.5% sodium hypochlorite solution (NaOCl). The apical foramina were then sealed with light-cured composite resin[3] to prevent bacterial leakage [11]. Finally the canals were flushed with 17% EDTA[4] for 1 min followed by 5 ml of 5.25% NaOCl for 3 min to remove the smear layer, and then each root canal was finally flushed with 5 ml of normal physiologic saline solution [12].

Each root was placed in a closed test tube containing 4 ml of brain heart infusion (BHI) broth,[5] sterilized by autoclaving at 121 °C for 20 min and incubated for 24 h at 37 °C to confirm sterility by absence of turbidity [13].

Three types of microorganisms isolated from clinical trials including *S. mutans, E. faecalis* and *C. albicans* were used. The patients and/or their parents received a detailed explanation about the experimental rationale, clinical procedures, possible risks and the procedures were approved by the Human Ethics Committee at the Tanta University, Faculty of Dentistry.

[1] Dica, Dendia, USA.
[2] Dentsply/Maillefer, Ballaigues, Switzerland.
[3] Z-100; 3M ESPE, St. Paul, MN, USA.
[4] Pulpdent Corporation, Watertown, MA, USA.
[5] Oxoid, Basing Stoke, UK.