Development of an intracanal polymicrobial biofilm and its susceptibility to different antibacterial intracanal medications .an in vitro study

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بسم الله الرحمن الرحيم

﴿وقالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم﴾

صدق الله العظيم

سورة البقرة ﴿32﴾

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INTRODUCTION

Introduction

Ideally root canal treatment should sterilize the root canal system (eliminate all living microorganisms in the entire root canal) however, given the complex anatomy of the system it is widely recognized that with the available instruments, substances and techniques achieving this goal is utopic for most cases, the reachable goal would be to reduce bacterial populations to a level below that necessary to induce or sustain disease [1].

Chemomechanical preparation is one of the most important phases of treatment, it serves to clean the most voluminous area of the system that harbors the largest amount of bacterial cells. This is especially applicable for bacteria remaining on root canal walls or within dentinal walls, however bacteria remaining in the apical part of root or lateral canals can maintain long standing infections relying on the sustainable source of nutrients from the periradicular tissues. Therefore, intracanal medicaments have been recommended as valuable adjunct in the disinfection of the root canal system and removing as much possible of the residual bacteria that can adversely affect treatment outcomes [1].

The root canal infection is a dynamic process, and different bacterial species apparently dominate at different stages[2]. Shifts in the composition of the microbiota is largely due to changes in

environmental conditions, particularly in regard to oxygen tension and nutrient availability. In the initial phases of the pulpal infectious process, facultative bacteria predominate, then after few days or weeks, oxygen is depleted as a result of pulp necrosis with the loss of blood circulation and consumption by facultative bacteria. Later anaerobic milieu develops which is highly conducive to the survival and growth of obligate anaerobic bacteria, with the passage of time, anaerobic conditions become even more pronounced particularly in the apical third of the root canal as a consequence anaerobes dominate the microbiota outnumbering facultative bacteria[3].

Because of the polymicrobial etiology of endodontic infections, and the significantly different bacterial community profiles from individual to another and the ability of endodontic pathogens to form biofilms. Treatment outcomes can be improved through using broad spectrum, nonspecific antimicrobial agents which have the potential to affect most members of the endodontic bacterial community.

The rationale for the use of intracanal medicaments rise from the fact that systemic antibiotics need an active circulation to bring the drug to the infection site which is not the case in the necrotic pulpless teeth. Therefore, local application of antibiotics is considered a more convenient delivery method limiting the use

of systemically administrated antibiotics in endodontics to cases with systemic manifestations of infection as fever, malaise, lymphadenopathy and diffuse facial swellings or as a prophylactic in medically compromised patients.

Various studies have been conducted on the use of intracanal medicaments including essential oils, phenolic compounds calcium hydroxide, steroids, chlorohexidine gluconate ,antibiotics and antibiotic combinations .However, all of the currently available antimicrobial materials for root canal irrigation and medication have limitations, and there is an ongoing research to find the best intracanal medicament to complement the chemomechanical debridement of the root canal systems .Therefore conducting a study to assess the effect of different intracanal medications on a mixed infection model was thought to be of value.

REVIEW OF LITERATURE

Review of Literature

1.Apical periodontitis as an infectious disease:

Apical periodontits is essentially an inflammatory disease of microbial etiology primarily caused by infection of the root canal system [4]. Bacteria are the major microorganisms implicated in the pathogenesis of apical periodontitis, when they come in contact with the periradicular tissues via apical, lateral foraminae or root perforations.

Inflammatory changes take place in the periradicular tissues and give rise to the development of apical periodontitis which can be acute or chronic depending on several bacterial and host related factors, and because of the infectious nature of the disease the goal of the root canal treatment should be to eradicate the occurring infection or prevent microorganisms from infecting or reinfecting the root canal or the periradicular tissues.

Microorganisms causing apical periododntitis were found to be organized in biofilms colonizing the root canal system

Riccui and Siqueira [5] evaluated the prevalence of bacterial biofilms in untreated and treated root canals of teeth evincing apical periodontitis,they biopsied specimens from 106(64

untreated and 42 treated) roots of teeth with apical periodontitis, specimens were obtained by apical surgery or extraction and were processed for histopathologic and histobacteriologic techniques bacteria were found in all but one specimen overall intraradicular biofilm arrangements were observed in the apical segments of 77% of the root canals (untreated canals 80% treated canals 74%).

Biofilms were also seen covering the walls of ramifications and isthmuses, bacterial biofilms were visualized in 62% and 82%of the root canals of teeth with small and large radiographic lesions respectively. All canals with very large lesions harbored intraradicular biofilms the overall prevalence of biofilms in cysts, abscesses and granulomas was 95%,83%&69.5%respctively and extraradicular biofilms were observed in only 6%of the cases.

Some criteria have been proposed to establish link between biofilms and infectious diseases [5-7]

1. infecting bacteria are adhered to or associated with a surface

2.direct examination of the infected tissues shows bacteria forming clusters or microcolonies encased in an extracellular matrix

3.the infection is generally confined to a particular site and although dissemination may occur, it is a secondary event