

## Original ARTICLE

### Assessment of the microbial flora in infected root canals

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#### ABSTRACT

**Background:** The success of endodontic treatment is directly related to the decrease in the number of root canal microorganisms. The present study was conducted to determine the microbial flora in infected root canals. **Materials & Methods:** The present study was conducted on 92 single rooted teeth of both genders. Bacterial samples were evaluated by means of an advanced microbiological technique specific for anaerobic species. **Results:** Out of 92 samples, 64 were from necrotic pulps (primary infection) and 28 from unsuccessful RCT (secondary infection). The difference was significant ( $P < 0.05$ ). Common bacteria isolated from root canals was Peptostreptococcus in 20.3% followed by Streptococcus in 18.1%, Porphyromonas in 15.5%, Enterococcus in 12.4%, Staphylococcus in 10.2%, Prevotella in 7.1%, Actinomyces in 6.5%, Veillonella in 5.9% and Eubacterium in 4%. The difference was significant ( $P < 0.05$ ). **Conclusion:** Authors found that common bacteria isolated from pulp chambers and root canals were Peptostreptococcus, Streptococcus, Porphyromonas and Enterococcus.

**Key words:** Streptococcus, Enterococcus, Bacteria

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#### INTRODUCTION

It has been established that bacteria initiate pulpal and periapical infections. The success of endodontic treatment is directly related to the decrease in the number of root canal microorganisms. Colonizing microorganisms result in pulpal and periapical diseases. Endodontic treatment involves the treatment of both primary and secondary infections in the root canal system. The composition of microflora of root canals has been the focus of considerable research over the years. Results of studies clearly defined the microbial differences between primary endodontic treatment and retreatment.<sup>1</sup>

Primary infected root canals are untreated canals, into which the microorganisms have gained access to colonize the pulpal tissue, resulting in dysfunction. Secondary infection in the root canal occurs due to the failure of endodontic treatment and presence of bacterial infection in the root canal system. Several studies have investigated the microflora of root canal system infections.<sup>2</sup> In primary root canal infections, necrotic pulpal tissue has revealed polymicrobial flora with an average of 4-7 intra-canal species, which are often Gram-negative anaerobics. Several studies have shown obligatory anaerobic bacteria in root canal infections, which comprise 90% of all bacterial species.

Bacterial biofilms are reported to be the most common cause of persistent inflammation. The morphology of root canal systems is complex and this favors growth of bacteria in the form of

biofilms.<sup>3</sup> The present study was conducted to determine the microorganisms in necrotic dental pulp and root canals.

#### MATERIALS & METHODS

The present study was conducted in the department of Endodontics. It comprised of 92 single rooted teeth of both genders. All patients were informed regarding the study and written consent was obtained. Ethical approval was obtained from institutional ethical committee prior to the study.

Bacterial samples were evaluated by means of an advanced microbiological technique specific for anaerobic species, which was used for isolation and identification of sampled strains. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

#### RESULTS

Table I, graph I shows that out of 92 samples, 64 were from necrotic pulps (primary infection) and 28 from unsuccessful RCT (secondary infection). The difference was significant ( $P < 0.05$ ).

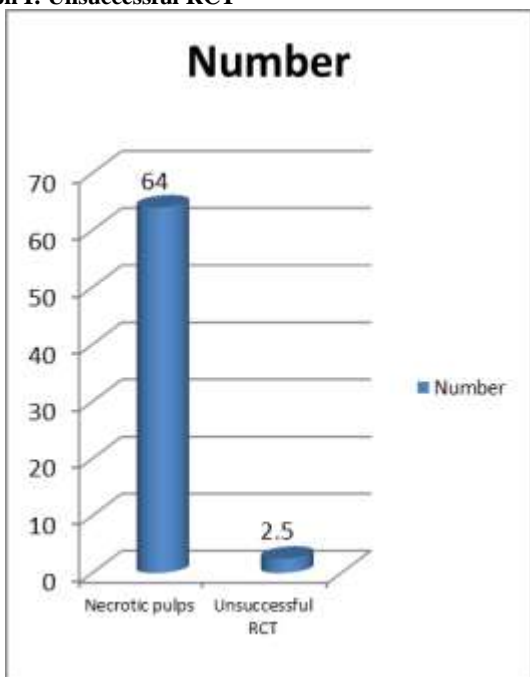
Table II shows that common bacteria isolated from root canals was Peptostreptococcus in 20.3% followed by Streptococcus in 18.1%, Porphyromonas in 15.5%, Enterococcus in 12.4%, Staphylococcus in 10.2%, Prevotella in 7.1%, Actinomyces in

6.5%, Veillonella in 5.9% and Eubacterium in 4%. The difference was significant ( $P < 0.05$ ).

**Table I:** Distribution of samples

Total- 92				
Type	Necrotic (primary infection) pulps	Unsuccessful RCT (secondary infection)	RCT	P value
Number	64	28		0.01

**Graph I: Unsuccessful RCT**



**Table II Prevalence of bacteria from the root canals**

Species	Percentage	P value
Peptostreptococcus	20.3	0.01
Streptococcus	18.1	
Porphyromonas	15.5	
Enterococcus	12.4	
Staphylococcus	10.2	
Prevotella	7.1	
Actinomyces	6.5	
Veillonella	5.9	
Eubacterium	4	

**DISCUSSION**

The resident microbial flora in the oral cavity typically contains  $10^{10}$  bacteria. Over 500 bacterial species are today recognized as normal inhabitants of the oral cavity. However, only 150 microbial species have been isolated and cultured from root canals.<sup>4</sup> The endodontium is a sterile cavity and the ingress of oral microbes to establish infection is quite difficult when compared to other dental tissues, as the microorganisms have to penetrate the enamel and dentine and overcome the host responses. Furthermore, they have to survive in the limited space, nutrients

and distinct habitat alongside other root canal microorganisms by genetic exchange, mutation and highly modified functions.<sup>5</sup>

Number of studies has shown that invasion of bacteria into dentin tubules occurs in 60- 90% of teeth with apical periodontitis. There are also suggestions that bacteria found in the dentin tubules are special and unique in comparison to the microflora of the oral cavity.<sup>6</sup> Existing knowledge about the ability of different species to invade dentin shows that such species as gram-positive facultative cocci, lactobacilli and actinomyces are more often found as invaders among other bacteria species. Obviously the environment of the tubules restricts supply of nutrients to bacterial species making their life conditions less favourable.<sup>7</sup> The present study was conducted to determine the microorganisms in necrotic dental pulp and root canals.

In present study, out of 92 samples, 64 were from necrotic pulps (primary infection) and 28 from unsuccessful RCT (secondary infection). Rôças et al<sup>8</sup> study was conducted on 150 single-rooted teeth of patients referring to a dental clinic. Sampling was performed by placing a sterile paper point in the canal for 60 seconds. Bacterial samples were evaluated by a microbiological technique specific for anaerobic species, used for isolation and identification of sampled strains. From the 150 samples taken, 101 were from necrotic pulps (primary infection) and 49 were from the teeth with an unsuccessful endodontic treatment (secondary infection). Enterococcus faecalis was a prevalent species in the failed root canals evaluated.

We found that common bacteria isolated from root canals was Peptostreptococcus in 20.3% followed by Streptococcus in 18.1%, Porphyromonas in 15.5%, Enterococcus in 12.4%, Staphylococcus in 10.2%, Prevotella in 7.1%, Actinomyces in 6.5%, Veillonella in 5.9% and Eubacterium in 4%.

It has been shown that improper restorations, carious lesions, and enamel cracks produced during access cavity preparation provide access routes to large dentinal tissues in many cases, leading to pulpal infection. Generally it is accepted that persistence of disease in periapical tissues is most commonly associated with a difficulties or mishapes which occur during or after initial endodontic treatment. Inadequate aseptic control, poor access cavity design, missed canals, inadequate instrumentation and leaking temporary or permanent restorations are the main factors that may be critically important in post-treatment disease.<sup>9</sup>

A classic study by Kakehashi and co-workers<sup>10</sup> in the 1960's demonstrated the role of infection in the demise of damaged pulps and this paved the way for a scientific basis for clinical studies. The study proved that pulp necrosis and periapical bone destruction occurred in both germ-free and non-germ-free rats when the pulp chambers were kept open to the oral cavity. An estimated 2-10 different species, total numbers varying between  $10^3$  to  $10^7$  are found in infected canals. It has also been seen that teeth with large long standing periapical infections contain very dense and more bacterial species in their root canals than in smaller periapical lesion.

**CONCLUSION**

Authors found that common bacteria isolated from pulp chambers and root canals were Peptostreptococcus, Streptococcus, Porphyromonas and Enterococcus.

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