Evaluation of Microflora and Its Antibiotic Susceptibility from Failed Endodontic Cases (An In-Vivo Study)

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ABSTRACT

BACKGROUND
The main cause of endodontic failure is the persistence of microorganisms that cause an intra radicular or extraradicular infection that has become resistant to disinfection measures. Root canal bacteria can be isolated as planktonic cells, suspended in liquid phase or aggregated or congregates in root canal wall as a biofilm. Presence of E. faecalis is more frequent in secondary infection and is found to be commonly associated with endodontic failure. We wanted to isolate and identify the organisms in root canal failed cases and determine the current antibiotic susceptibility pattern.

METHODS
The study was conducted on 51 patients attending the OPD. None of the patients had received antibiotics for 3 months. The root filling was removed and the canal length was measured with apex locator and small K file. Sterile normal saline was drawn into canal which was absorbed onto 2 to 3 sterile paper points. For bacterial culture samples were transferred to BacT/ALERT transport medium bottle and sent for sensitivity by using VITEK-2 automated analyser.

RESULTS
Out of a total of 51 cases studied, 46 cases showed growth of microorganisms. In 5 cases, there was no growth. The predominant bacterial isolate was analysed in each case and a total of 18 types of bacteria were isolated. Among them 17.3% cases reported Enterococcus faecalis. Facultative anaerobic bacteria were more prevalent with 88.8% and obligate aerobes constituted 11.1%.

CONCLUSIONS
The fact that Enterococcus spp. was found in majority of cases indicates that Enterococcus is the predominant bacterium responsible for endodontic failure in this particular sub-population.

KEYWORDS
Root Canal Treatment, Enterococcus faecalis
BACKGROUND

Apical periodontitis persisting after root canal treatment presents a complex etiological and therapeutic situation.\(^1\) It appears that certain species of microorganisms, especially Gram-positive facultatives, which often have expanded representation in retreatment cases in comparison with primary endodontic treatment, possess greater resistance to antimicrobial agents used during endodontic treatment than anaerobes.\(^2,3\) Bacterial biofilms are reported to be the most common cause of persistent infection.\(^4\) The influence of bacterial persistence in the root canals on treatment outcome is an important issue in endodontics because bacteria have been shown to play a major role in persistence or emergence of apical periodontitis lesions after root canal treatment.\(^5\) The earlier studies have shown the increased resistance of microorganisms to conventional antibiotics. This is in confirmation with the statement of Wood R\(^6\) who had reviewed the antibiotic sensitivity pattern of pathogenic microorganisms over a span of 20 years. The wide use of antibiotics has fostered the selection of resistant bacteria.

METHODS

The study was conducted on 51 patients. None of the patients had received any systemic antibiotic therapy in the preceding 3 months. All of the teeth had demonstrated radiographic signs of chronic apical periodontitis. All patients had completed root canal therapy more than 1 year previously. All the samples were taken with the sterile instrument. A rubber dam was applied, and the operating field was disinfected using Moller’s protocol. Endodontic access was achieved using a sterile high speed carbide bur until the root filling was exposed. All the coronal restorations, posts and carious lesion was removed. The root filling was removed using Gates Glidden drills, protaper retreatment files, Hedstrom file and K files without the use of chemical solvent under irrigation with sterile saline. The root canal length was measured with electronic apex locator. The solution inside the canal was absorbed onto a gauge needle was taken. Sterile normal saline was drawn and periodic reading. Each vial contains the sensor which responds to the concentration of CO\(_2\) produced by the metabolism of the microorganisms or the consumption of O\(_2\) needed for the growth of microorganisms. The sensor in vial is monitored by the instrument every 10 minutes for increase in fluorescence, which is proportionate to the increasing amount of CO\(_2\) or decreasing amount of O\(_2\) present in the vial. A positive reading indicates the presumptive presence of viable microorganisms in the vial.

RESULTS

Out of a total of 51 cases studied, 46 cases showed growth of microorganisms. In 5 cases there was no growth. The predominant isolate bacteria were analysed in each case and total of 18 types of bacteria were isolated and among them 17.3% cases reported Enterococcus faecalis. Other bacteria isolated include Enterobacter cloacae complex, Pseudomonas aeruginosa, Enterococcus faecium, Escherichia coli, Klebsiella pneumonia, and Staphylococcus hominis. Acinetobacter baumannii,Ralstonia pickettii, Staphylococcus aureus and streptococcus salivarius Candida albicans etc. Furthermore, in analysing the bacteria present in failed root canal cases on gram staining, it was found that 55.5% cases were gram negative and 44.4% were gram positive. Facultative anaerobic bacteria were more prevalent with 88.8% and obligate aerobes were constituted 11.1%. Most of the gram-positive bacteria were sensitive linezolid, teicoplanin, vancomycin and amoxiclav. Gram negative bacteria were mostly sensitive to amikacin, gentamycin, cefotaxime, cefepime, cefoperazone, tazobactam, imipenem, meropenem.

DISCUSSION

According to Moller and Kakehashi have established that microorganism is the principle cause of failure in endodontics. Torabenajad, Ray, Trope believed microorganism invade the canal via coronal leakage. Studies from around the world have shown the predominance of Enterococcus faecalis responsible for failure of most endodontic therapy.\(^1,8\) Studies report the prevalence of Enterococcus faecalis ranging from 24% up to 77% in teeth with failed endodontic treatment.(Sonia Bhonchal Bhardwaj et al 2013).\(^9\) It has been found in the study that microorganisms species found in one region is different from other geographical region. This is due to the fact that different method of collection of sample and methodology

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used for microbial identification. Also there is difference in the environment and genetic determinants of the microbial colonization of the oral cavity.\textsuperscript{10} The earlier cases showed increased resistance of microorganism to conventional antibiotics. This is in confirmation with Wood R who had review AST pattern over past 20 years. He stated that there is continuous decline in the sensitivities of the bacteria isolated to most of the antibiotics. The widespread use of antibiotics leads to the selection of resistant bacteria. Resistant genes are transferred vertically & horizontally to the daughter cells by transduction, transformation and conjugation. Thus, strains of bacteria never exposed to the antibiotic may acquire resistance without ever coming in contact with the antibiotic. It is therefore necessary to determine the antibiotic susceptibility of the bacteria involved and correct antibiotic dosages to maintain therapeutic levels. In the present study, Enterococcus faecalis was the most commonly found microorganism. This finding agrees with those reported by Molander et al.\textsuperscript{11} and Sundquist et al.\textsuperscript{12} who respectively found E. faecalis in 47 and 38% of previously root treated canals with positive culture. Peculiene et al.\textsuperscript{13,14} reported (in two studies) a higher isolation frequency of this microorganism: 70 and 64%. Munish Batra & Rajiv Kaur found 18 out of 30 samples were E. faecalis and 10 out of 30 samples were anaerobic microorganisms.\textsuperscript{15} Heena Sadiq 6/54 samples E. faecalis, gram positive bacteria were not the most prevalent in the primary infection.\textsuperscript{16} E.T. Piheiro found 11/24 samples E. faecalis, facultative anaerobes 58%, obligate anaerobes 42%, gram positive species 80%. A/c to Hung-Chih chien et al 83/111 (74.75) demonstrated viridans group of streptococci were most abundant. The isolation of Enterococcus was 12.6% (13/111). Susceptibility and antibiotic sensitivity of different bacteria were analysed and linezolid, teicoplanin & vancomycin were the most effective antimicrobial against gram positive bacteria and Amikacin, Gentamycin, Cefotaxime, Cefepime, Cefoperazone, Piperacillin/tazobactam, Imipenem and Meropenem were the most effective antimicrobial against the gram negative bacteria for root canal failure.

The fact that Enterococcus spp. was found in majority of cases indicates that Enterococcus is the predominant bacterium responsible for endodontic failure in this particular sub-population. Susceptibility and antibiotic sensitivity of different bacteria were analyzed and it was found that linezolid, teicoplanin & vancomycin were the most effective antimicrobials against gram positive bacteria and amikacin, gentamycin, cefotaxime, cefepime, cefoperazone, piperacillin/tazobactam, imipenem and meropenem were the most effective antimicrobial against the gram negative bacteria for root canal failure.

CONCLUSIONS

REFERENCES


