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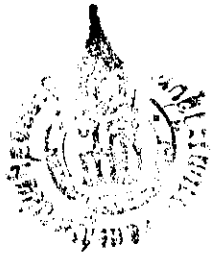

Abstract

In recent years, considerable interest has been generated in the role of root canal anaerobic microorganisms in causing inflammation and pain. However, the technique commonly used in clinical endodontic culturing fails to adequately support growth of anaerobic bacteria. This study used reduced thioglycolate as a culture medium to correlate between aerobic and anaerobic bacteria presented in root canals and postobturation evaluation. Forty single-rooted teeth with chronic apical periodontitis were studied. An aseptic technique was used throughout the treatment.The root canals were prepared by a step-back method, irrigated with 2% sodium hypochlorite and medicated with calcium hydroxide.The access cavities were sealed with Cavit®.A week later, the intracanal dressings were removed by rinsing with normal saline and a sample for bacteriological examination was collected from the root canal and placed into a tube of reduced thioglycolate medium and cultivated under aerobic and anaerobic conditions.The root canals were obturated by the lateral condensation method a week after the second appointment. The results 1 week after obturation indicated that there was no significant correlation between bacterial culture result and postobturation pain and swelling ($p>0.05$).Within 6 months recall, there was no significant correlation between bacterial culture result and radiographic evaluation ($p>0.05$) as tested by Fisher's Exact. In conclusion, there was no correlation between the bacterial culture result in root canal and postobturation symptoms.

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Introduction

Pulpal infection due to dental caries is the most common cause for endodontic treatment. Successful endodontic therapy depends upon reduction or elimination of these microorganisms followed by restoration of the physical integrity of the damaged tooth[1]. In recent years, considerable interest has been generated in the role of anaerobic microorganisms in causing inflammation and pain. Many of the chronic periapical lesions are associated with the presence of anaerobic microorganisms, alone or in combination with other species[2]. Pain or swelling that accompany root canal infections have been reported to be associated with the presence of anaerobic rods, such as bacteroides, eubacterium, and fusobacterium[3-5].

Bacteriologic culturing has been performed to monitor the sterilization of the root canal system. Studies relating success or failure of endodontic treatment to the bacteriologic status of the root canal revealed an average success rate of 94% for obturations in canal with a negative culture[6]. This number was compared to an 84% success rate for obturated canals with a positive culture. In a study by Bender and associates, however, no differences were found in the success of endodontic therapy in teeth yielding positive or negative cultures prior to obturation[7]. In another study, researchers concluded that root canal cultures should be omitted in cases where no periradicular involvement was noted[8].

For the most part, the previous studies utilized aerobic incubation which favored aerobes and ignored other species which are anaerobes. One of the many criticisms of endodontic culturing is that the technique commonly used fails to adequately support growth of anaerobic bacteria. Griffee and associates compared the growth of endodontic bacteria in a reduced medium to growth in commonly used conventional unreduced medium. Growth in reduced thioglycolate was significantly greater than growth in unreduced trypticase-soy broth by a ratio of over 2:1[9].

The purpose of this study was to correlate between the bacterial culture result in root canal and postobturation evaluation. This was done by using reduced thioglycolate medium and aerobic and anaerobic incubation.

Materials and Methods

Material from the root canals of 40 permanent single-rooted teeth of patients seen at the Dental Hospital, Faculty of Dentistry, Prince of Songkla University, was studied. These patients were diagnosed as having chronic apical periodontitis by clinical and radiographic examinations. An aseptic technique was used throughout the treatment. The involved tooth was isolated with a rubber dam and disinfected with Betadine antiseptic solution. The root canals were cleaned and shaped in the first appointment using the step-back technique and irrigated with 2% sodium hypochlorite. The root canals were dried with sterile paper points and filled with a paste of calcium hydroxide and saline solution in a creamy consistency, placed in the canals by means of a Lentulo spiral. The access cavities were then sealed with a more than 3.5 mm-thick layer of Cavit® (Premier Dental Products Co., Philadelphia, PA).

A week later, the intracanal dressings were removed by rinsing with sterile saline solution. The canals were dried thoroughly with sterile paper points. New sterile paper points were then inserted aseptically into the canals, advanced to as close to the apex as possible, and held in place for 60 seconds. On removal, the paper point was placed into a tube of reduced thioglycolate medium allowing minimal exposure of the sample to oxygen. As soon as the material was placed into the transport media, the test tube was sealed tightly with a stopper and transferred to the laboratory.

The tube, with contained glass beads, was agitated in a mechanical mixer until the paper points disintegrated. Under anaerobic system (Model 1029, Forma scientific, Inc., Ohio, USA.) , from the reduced thioglycolate aliquots of 0.1 ml. were inoculated onto four blood agar plates. Two blood agar plates were incubated anaerobically for 7 days at 37°C. And the other two blood agar plates were incubated aerobically for 7 days at 37°C. Plates used in this study for cultivation of the specimens were preincubated at 37°C for 48 hours. The plates incubated aerobically and anaerobically were observed daily for growth and the total number of bacteria were determined.

At the third appointment, a week later, the root canals were obturated by the lateral condensation method a week after the second appointment. The teeth were then evaluated a week and six months after obturation. Pain and swelling were observed for one week evaluation. For six

months, the radiograph was taken for observation of periradicular changing. The determination of success and failure based on the criteria presented in the *Quality Assurance Guidelines* published by the American Associations of Endodontists[10].

Results

The results of bacteriological examinations and one week postobturation evaluation are shown in Table 1 and 2. Positive cultures were obtained from 17 teeth (42.50%). Anaerobic bacteria were found in samples from 14 root canals (35.0%). Aerobic bacteria were found from 14 root canals (35.0%). Nine of 40 patients had sensitivity to percussion. Only one of nine teeth had an anaerobic infection. The results 1week after obturation indicated that there was no significant correlation between bacterial culture
result and postobturation pain and swelling ($p>0.05$)

Table 1 Correlation between anaerobic bacterial culture and 1 week postobturation evaluation

	pain/swelling +	pain/swelling -	total
anaerobic +	1	13	14
anaerobic -	8	18	26
total	9	31	40

Table 2 Correlation between aerobic bacterial culture and 1 week postobturation evaluation

	pain/swelling +	pain/swelling -	total
aerobic +	0	14	14
aerobic -	9	17	26
total	9	31	40

The six months recall rate was 87.5 percents. The results of bacteriological examinations and 6 months postobturation evaluation are shown in Table 3 and 4. Thirty-one of 35 teeth (88.57%) were clinical and radiographic successful. Four of 35 teeth were clinical successful but radiographic questionable. Anaerobic bacteria were found from 1 of 4 unsuccessful cases. Within 6 months recall, there was no significant correlation between bacterial culture result and clinical and radiographic evaluation ($p>0.05$) as tested by Fisher's Exact.

Table 3 Correlation between anaerobic bacterial culture and 6 months postobturation evaluation

	success	questionable	total
anaerobic +	11	1	12
anaerobic -	20	3	23
total	31	4	35

Table 4 Correlation between aerobic bacterial culture and 6 months postobturation evaluation

	success	questionable	total
aerobic +	13	1	14
aerobic -	18	3	21
total	31	4	35

Discussion

Pulp necrosis and apical periodontitis are caused by bacteria[11]. Various studies have indicated that the outcome of endodontic treatment is often unsuccessful if bacteria are present in the root canal when it is obturated. Therefore the aim of the treatment should be elimination or reduction the bacteria from the root canal systems[12].This is achieved by a combination of measures such as mechanical cleansing, irrigation with various antibacterial solutions and deposition of antibacterial dressings in the canals. Bystrom and colleagues[13] indicated that calcium hydroxide paste as a dressing in carefully instrumented and irrigated root canals kills the bacteria so effectively that endodontic treatment of primarily infected root canals can be completed in 2nd appointments.

An increased incidence of pretreatment and interappointment (flare-ups) symptoms was found in cases with periapical radiolucency[14]. Sundqvist[15] and Eggink[16] found a greater number of dangerous obligate anaerobes in the pulp of teeth having the largest periapical radioloucencies. According to Harrison and colleagues, significant relationship was found between postopturation symptoms and interappointment symptoms[17]. From previous studies, it may be assumed that the more number of bacteria presented in the root canals, the greater the chance of postobturation symptoms. In the present study, 9 of 40 patients (22.5%) had postobturation symptoms. Only one of nine teeth had an anaerobic infection. The results 1 week after obturation indicated that there was no significant correlation between bacterial culture result and postobturation symptoms.

In different studies the success rate for root canal treatment ranges from 53% to 95%. The present of periapical pathosis prior to treatment is a significant factor for endodontic failure[18]. The criteria for clinical success used in the present study indicate a clinical outcome in which there are no adverse clinical signs and symptoms. Radiographically, there should be elimination of previous rarefaction, normal to slightly thickened periodontal ligament space, normal lamina dura, no evidence of resorption. The obturation should be dense, three-dimensional obturation of the visible canal space in the confines of the root canal space, extending to the cementum-dentin junction[10]. Within 6 months, 35 of 40 patients(87.5%) came for follow-up. Thirty-one of 35 teeth (88.57%) were clinical and radiographic successful. Four of 35 teeth were clinical successful but radiographic questionable. However, these

four cases shown slight repair of previous rarefaction that may heal after 6 months recall. Anaerobic bacteria were found from 1 of 4 unsuccessful cases.

The aim of endodontic treatment is to eliminate the bacteria from the root canals of involved teeth and then to allow for resolution and repair of any damaged periradicular tissues. At one time culturing was used to check the sterility produced by routine endodontic treatment regimens. Currently, this routine culturing is not generally performed, because today's standard techniques have been shown to be effective in eliminating the majority of microorganisms. In a survey conducted in 1985, Trope and Grossman found that 37% of the undergraduate endodontic programs and 20% of the graduate programs were taking cultures in their treatment protocol[19]. In another study, researchers concluded that bacteriologic cultures should be omitted in cases where no periradicular involvement was noted[8]. From the present study, the authors no longer considered the culturing technique necessary for cases having and no periradicular involvement.

Conclusion

It may be concluded that the bacterial culture in root canal is not related to the postobturation symptoms. Furthermore, the root canal cultures should be omitted in cases where a periradicular involvement is noted.

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