IMPORTANCE OF MICROBIOLOGICAL ANALYSIS OF THE RADICULAR CANALS CONTENT IN CHRONIC APICAL PERIODONTITES

Cristina Dobrea¹, Tinca Mioara Navrotescu²

1. Lecturer, Dept of Odontology, Faculty of Med. Dent., “Apollonia” University of Iasi
2. Assoc. Prof PhD., Dept of Odontology, Faculty of Med. Dent., “Apollonia” University of Iasi
Corresponding author: Dr. Cristina Dobrea: albident72@yahoo.com

Abstract

The present study analyzes the composition of the endodontic microbial flora in teeth affected by non-treated chronic apical periodontitis, as well as in teeth subjected to unsuccessful conservative endodontic treatments. Materials and method: The content of 20 radicular canals belonging to teeth with chronic apical periodontitis subjected to no previous endodontic treatment, and of 20 obturated canals of teeth subjected to unsuccessful 1-5 year-old conservative endodontic treatment (the teeth having to be surgically treated, as well) was microbiologically analyzed. Results: The microbial flora collected from the analyzed samples included: Gram negative bacilli (BGN); Gram positive bacilli (BGP); Gram negative cocci (CGN); Gram positive cocci (CGP). In most samples (10 cases, 50%), only one microorganism was found. Two microbial species were identified in 3 cases (15%); in 5 radicular canals (25%) - bacterial associations were determined, and in 2 samples (10%) no cultured microorganisms could be observed. In the radicular canals previously endodontically-treated and obturated, the most frequently occurring was Enterococcus faecalis (11 samples, out of which, in 6 cases, as the only cultured microorganism). The value of the correlation coefficient, r=0.914832, indicates the close association between the presence of microorganisms in the radicular canals and the failure of the conservative therapy. Conclusions: The endodontic treatment of chronic apical periodontitis necessarily requires destruction of the microorganisms in the radicular canals. Identification of bacteria in the infected canals and adjacent areas, as well as checking on the sterilization of the endodontic space prior to obturation, might improve the long-term success of the conservative treatment of chronic apical periodontites. Keywords: microbiological analysis, radicular canals, chronic apical periodontites

INTRODUCTION

Microbial flora can penetrate the endodontic and periapical space by the development of a carious process which comes to open the pulp room, through the lateral adjacent canals which communicate with the possible periodontal pockets, through enamel fissures, as well as well as backwards, through the apical foramen and the hematogene way, following anachoresis.

Minute studies on the method of collecting, transport and cultivation showed that the most frequently occurring strains are the ones normally present in the oral cavity, where other bacteria from the outside environment are quite rare (1). The role played by the anaerobic germs in endodontic infections was extensively discussed (2).

The amount of bacteria varies from one tooth to another, usually, during isolation operations, a mixed flora, including 8-10 bacterial descendants being observed. Several different descendants may be present but, usually, one or – at most – two bacterial species are prevailing (3,4).

Bacterial infection is commonly limited to the endodontic space, the bacteria being developing on the basis of the tissular necrotic rests and of the tissular fluids present, occasionally invasion being also extended to the level of the periapical tissues and of the periodontal ligaments (5,6).

To establish the diagnosis and also microbial susceptibility, the samples taken over from the canal should be cultured with technologies permitting both culture of anaerobic and facultatively anaerobic microbes, and indication of the relative ratios of the present descendants. The technology necessary for the cultivation and identification of the anaerobic bacteria is quite complicated, requiring suitable equipments (7,8).

The recommendation is made that, prior to any bacteriological sampling, the sterility of the operating field should be checked (1). Any culture should be developed so that its results will exactly indicate the microbial conditions from the canal.
In a previous consultation, sufficient enlargement of the canal should be assured, so that to grant a real checking of debridement efficiency (9).

SCOPE AND OBJECTIVES

The scope of the present study is to evaluate the composition of the microbial flora from the canals of the teeth affected by chronic apical periodontitis, either untreated or unsuitably treated, and to establish the role played by microbiological analysis in the conservative endodontic treatment of chronic apical periodontitis.

MATERIALS AND METHOD

For attaining the objectives had in view, the content of 20 radicular canals belonging to teeth affected by chronic apical periodontitis, subjected to no previous endodontic treatment, and of 20 obturated canals belonging to teeth having received an unsuccessful conservative endodontic treatment 1-5 years ago (the teeth requiring additional surgical treatment), was microbiologically analyzed.

The surgical protocol included: cleaning of the oral cavity through scaling with U.S and Air Flow; isolation of the operating field; access to the endodontic space and cleaning of the cavity with a 5% Na hypochlorite solution and then with 5% Na thiosulfate, for inactivation and for not altering the results of the tests.

In the case of teeth subjected to no previous endodontic treatment, a reduced transport fluid was introduced in the radicular canal, with a syringe with a very thin needle, liquid absorption being performed with sterile cones.

In the teeth subjected to previous endodontic treatment, radicular obturation was removed by manual and mechanical methods; to make sampling easier, the canals were irrigated with a saline solution; further on, for 30 sec., 3 sterile cones made of absorbant paper were introduced in the radicular canal, after which they were introduced in labelled sterile tubes containing 1 ml R.C. broth regenerated through boiling.

Within about 15 min, the samples were transported to the laboratory, where they were incubated at 37ºC, under anaerobiosis conditions, for 48 hr; further on, 10 seriated samples, each with 100 µl dilutions, were made.

Samples from each tube were impregnated, on Petri plates, with Wilkins-Chalgren Agar additivated with 5% human blood (25 ml/plate 90 mm in diameter). The plaques were incubated anaerobically at 37 ºC, for 7 days.

Microorganisms identification was based on Gramcoloration and Biomerieux® kits, for rapid identification.

RESULTS AND DISCUSSION

In a first stage, the results of the microbiological tests of the samples taken over from the radicular canals of the teeth with chronic apical periodontitis, subjected to no previous treatments, were analyzed.

Cultured microorganisms were put into evidence for all 20 radicular canals under investigation, about 5-8 structures for each canal.

The calculated distribution was the following: Gram negative bacili 51%, Gram positive bacili 29%, Gram negative cocci 5%, Gram positive cocci 15% (fig. 1).

Figure 1. Distribution of microbial species in the tested samples
Distribution of the microbial species present in the radicular canals of the teeth affected by chronic apical periodontitis with no previous endodontic treatments. Total: 20 canals

In a second stage, the results of the microbiological tests performed on samples taken over from the obturated radicular canals of the teeth affected by chronic apical periodontitis and unsuccessfully treated by a previous conservative endodontic treatment, were analyzed.

Analysis of bacterial prevalence put into evidence cultured microorganisms for 18 samples (90%), out of the total number of 20 samples tested, taken over from the radicular canals, subjected to previous endodontic treatment.

Thus, in most situations (10 cases, 50%), only one microorganism was observed, 2 microbial species (3 cases, 15%) while, in 5 radicular canals (25%), bacterial associations were evidenced and, in 2 samples (10%), no cultivable microorganisms were found out (fig. 2).

Fig. 2. Distribution of microbial species present in the radicular canals of the teeth with chronic apical periodontitis, subjected to previous endodontic treatments

Total: 20 previously-obturated radicular canals

In the case of endodontically-treated and previously obturated radicular canals, the most significant presence was that of the Gram positive cocci, Enterococcus faecalis being the most frequent one (11 samples, 6 of which as the only cultivable microorganisms present).

Specific tests have been applied for evidencing the correlations that may be established between failure of the conservative endodontic treatment and the presence of cultured microorganisms in the radicular canals.

Table I

<table>
<thead>
<tr>
<th>Failure of conservative therapy-presence of microorganisms in the radicular canal</th>
<th>correlation</th>
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<tbody>
<tr>
<td>Correlation coefficient</td>
<td>Significance level</td>
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<tr>
<td>r=0.914832</td>
<td>p=0.002346</td>
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The value of the correlation coefficient, r=0.914832, indicates the close association between the presence of microorganisms in the radicular canals and the failure of the conservative therapy (Table I).

The study on the importance of microbiological tests on the content of radicular canals in the therapy of chronic apical periodontites opens the way to future researches for reaching practical conclusions.

CONCLUSIONS

1. In the case of chronic apical periodontites, bacterial infection is heterogeneous, involving Gram negative bacilli, Gram positive bacilli, Gram negative and Gram positive cocci.
2. Microorganisms survival in the radicular canals, after application of the endodontic treatment, is significantly correlated with the failure of conservative therapy.
3. The long-term endodontic treatment of chronic apical periodontites might be more successful if the efficiency of the aseptic-antiseptic treatment is bacteriologically checked prior to the obturation of the endodontic space.
References