IN VIVO STUDY OF CALCIUM HYDROXIDE ENDODONTIC TREATMENT IN CHRONIC APICAL PERIODONTITIS

Gheorghiu Irina-Maria¹, Mitran Loredana², Mitran M.³, Temelcea Anca-Nicoleta⁴, Scarlatesc Sanziana⁵, Calenic Bogdan⁶, Perlea Paula⁶

ABSTRACT

The aim of this study was to evaluate the in vivo efficiency of endodontic treatment with calcium hydroxide in chronic apical periodontitis by determining the microbial load from the endodontic space in different stages of treatment. The microbiological determinations that have been made have led to the conclusion that calcium hydroxide possesses a redoubtable antimicrobial activity, but only with the condition of long-lasting contact with the root canals. Another important result is the essential role of the rigorous biomechanical treatment of the root canals, intracanal medication with calcium hydroxide is addresses mostly to microorganisms located in root canal ramifications.

Keywords: chronic apical periodontitis; endodontic microflora; calcium hydroxide;

Introduction

Our study was made on 10 cases (teeth) with chronic apical periodontitis, with pulp chamber closed. Biological samples was taken from endodontic space in order to isolate and identify microbial species and strains involved in the chronic periapical process(1). The main aim of this study was to evaluate in vivo antimicrobial activity and efficiency of calcium hydroxide endodontic dressing on endodontic microflora. Informed consent of patients has been taken before starting the present study.

Material and method

Microbiological determinations were carried out as follows: in the first treatment session, prior to the biomechanical endodontic treatment, after its completion, and in the second treatment session. In this session biological samples were taken from intraradicular space in order to determine the microbial population that resisted the antibacterial effect of calcium hydroxide endodontic antiseptic.

The method of endodontic microflora sampling was: insertion into the root canal of a sterile paper cone as deep as 1-2 mm of apex and maintained at this level 1-2
Table 1 Bacteria species initially identified, after biomechanical treatment and after 48-hours calcium hydroxide endodontic treatment

<table>
<thead>
<tr>
<th>Species</th>
<th>Initial No.</th>
<th>%</th>
<th>No. after biomech. treatment</th>
<th>%</th>
<th>No. after Ca(OH)2 treatment</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clostridium</td>
<td>3</td>
<td>15,00</td>
<td>2</td>
<td>10,00</td>
<td>2</td>
<td>10,00</td>
</tr>
<tr>
<td>Peptostreptococ</td>
<td>3</td>
<td>15,00</td>
<td>1</td>
<td>5,00</td>
<td>1</td>
<td>5,00</td>
</tr>
<tr>
<td>Veilonella</td>
<td>1</td>
<td>5,00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Eubacterium</td>
<td>3</td>
<td>15,00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fusobacterium</td>
<td>3</td>
<td>15,00</td>
<td>1</td>
<td>5,00</td>
<td>1</td>
<td>5,00</td>
</tr>
<tr>
<td>Prevotella</td>
<td>4</td>
<td>20,00</td>
<td>1</td>
<td>5,00</td>
<td>1</td>
<td>5,00</td>
</tr>
<tr>
<td>Bacteroides</td>
<td>1</td>
<td>5,00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Porphyromonas</td>
<td>2</td>
<td>10,00</td>
<td>1</td>
<td>5,00</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100</td>
<td>6</td>
<td>30</td>
<td>5</td>
<td>25</td>
</tr>
</tbody>
</table>

Results

Following the bacteriological diagnosis it was found that initially all the samples were positive for the anaerobic and aerobic germs, in acord to literature dates(7). Microbial strains belonging to the following types were isolated: Fusobacterium, Porphyromonas, Prevotella, Bacteroides, Peptostreptococcus, Veilonella, Actinomycetes, Eubacterium, Clostridium. Following antibacterial treatment, the following results were obtained:

I. The results obtained at 48 hours indicate that from 20 initially microbial species indentified, biomechanical endodontic treatment succeeded in the removal of 14 species. The number of strains isolated after 48 hours of endodontic calcium hydroxide antiseptic treatment is 5, meaning 25% of the initial value. Percentage is expressed by an efficacy value of 16.67% over the 48-hour interval.

II. The results obtained for the other half of the group of patients treated with calcium hydroxide and assay of biological results at 10 days are:

- the number of initially isolated microbial species: 15.
the mechanical treatment of the canal, together with endodontic lavage with sodium hypochlorite, reduced the number of species identified at 5.

* after a 10-day interval we detected only 1 microbial species which survived inside endodontic space, representing 13.34%. Within 10 days calcium hydroxide paste reduced microbial load from 33.31% (resulting from biomechanical treatment) to 6.66%. Practically, the antimicrobial efficacy of calcium hydroxide at 10 days is 80%.

### Discussions

The result of this microbiological in vivo study of calcium hydroxide antimicrobial activity revealed two seemingly conflicting aspects of the bactericidal effect on endodontic flora: calcium hydroxide has a very high efficiency when placed inside the root canals for a longer period of time (10 days) and, respectively, extremely low in effectiveness on endodontic germs after 48 hours (25% of isolated microbial species persisted). This is only in apparent contradiction with literature data, because in fact the antimicrobial effect of calcium hydroxide appears and increases over time, as the contact time with endodontic microorganisms increases(8,9). The maximum efficacy of calcium hydroxide occurs when it remains in the root canal for at least 7 days.

Another aspect to be highlighted is that the results of this study confirm the essential role of rigorous biomechanical treatment of root canals in the elimination of endodontic infection. Virtually most of the microorganisms are removed by root canal preparation. Most of the bacteria that persist in the endodontic space after a properly executed biomechanical treatment are located in the ramifications of the root system and are inaccessible to their direct mechanical removal(10). The endodontic antiseptic treatment in chronic apical periodontitis addresses precisely these microorganisms.

Calcium hydroxide has, apart from the antibacterial effect in cell membranes due to pH 12.5, also the ability to denaturation proteins inside endodontic space, making them less toxic to the host organism. However, it takes a period of time varying from week to month to act on residual germs inside dentinal tubules from the root canal walls(11).

Likewise, calcium hydroxide is the only endodontic treatment that possesses the ability to initiate and stimulate the remineralization of periapical areas affected by chronic apical periodontitis. Indisputably, from this point of view, calcium hydroxide is the most valuable endodontic medication.

### Conclusions

Regarding bactericidal effect of calcium hydroxide used as interappointment dressing endodontic we can conclude that it possesses a low endodontic disinfection capacity within 48 hours of placement, but within 10 days, its efficiency increases spectacularly. It has therefore...
been shown that calcium hydroxide possesses a redoubtable antimicrobial activity, but only with the condition of long-lasting contact with the root canals.

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**References**