DIAGNOSIS AND FOLLOW-UP OF THE PERIAPICAL LESIONS IN THE NON-SURGICAL ENDODONTIC TREATMENT: A CBCT STUDY

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ABSTRACT

Aim of the study
The study aimed to determine, by using CBCT, the prevalence and the extension of the periapical healing processes during short term follow-up of the endodontically treated chronic apical lesions.

Material and methods
Using CBCT examen, 15 teeth (20 roots) affected by chronic apical periodontitis were selected for this study. Ez3D 2009 Plus software was used to perform accurate measurements of bone lesions before and 3 months after treatment.

Results
The results of our study show the partial healing of the chronic periapical lesions after non-surgical endodontic treatment, with a prevalence of the healing reactions of 77% for CAP with CBCT-PAI 3, 43% for CAP with CBCT-PAI 4, and 25% for CAP with CBCT-PAI 5. For the entire study group, partial healing was observed at 3 months follow-up in 65% cases, with higher percents (77%) for teeth with CBCT-PAI 3.

Conclusion
CBCT diagnostic and the follow-up of the results in the case of the non-surgical endodontic therapy of the chronic apical periodontitis is a reliable tool that must be considered for an extended use in the endodontic field.

Key words: chronic apical periodontitis, CBCT, CBCT-PAI, periapical healing

INTRODUCTION
Considering the limited diagnostic potential of the conventional bidimensional radiographs, endodontic diagnosis and treatment planning has taken a giant leap forward due to introduction of cone beam computed tomography (CBCT) in dentistry. CBCT provides better insight into diagnostic dilemmas and complicate treatment decisions regarding chronic apical periodontitis (CAP) [1]. Literature data show that high percentage of cases confirmed as healthy by radiographic examen revealed apical periodontitis on CBCT and CBCT confirmed the enlargement of the chronic periapical lesions where reduced size of the existing radiolucency was diagnosed by radiographic examen [2]. Despite the advantages, CBCT have a limited use of only 17% investigations in endodontics field [3].

AIM OF STUDY
The study aimed to determine the prevalence of partial periapical healing during short term CBCT follow-up of the endodontically treated chronic apical lesions and to measure the decrease of the CAP sizes in various slices.

MATERIALS AND METHODS
The research was performed on a study group of 13 patients (age 20-40) treated in Clinical Medical Base of Dental Medicine Faculty, U.M.F. “Grigore T.Popă” Iassy. The informed consent was obtained from all patients included in study.

The CBCT diagnosis and the follow-up of non-surgical endodontic treatment were performed on 15 teeth (8 bicuspid and 7 molars) with 20 roots diagnosed on radiographic examen with chronic apical periodontitis. CBCT images were obtained using PaX-Uni3D (VAT PANO04, VATECH) and Ez3D 2009 Plus software. CBCT parameters were settled for 20 seconds exposure time, 85 kV, 5mA.

All patients were treated using standardized mechanic and chemical
treatment followed by Ca(OH)$_2$ paste for 14 days. The root fillings were performed by cold lateral condensation technique and Endoflas sealer (Sanlor) with antibacterial properties. The coronal restorations were performed using glass ionomer Ketac Molar (3M/ESPE) and composite resin Filtek250 (3M/ESPE). CBCT images were assessed in corono-apical, mesial-distal, buccal-oral slices using CBCT-PAI index [4] (table 1). Ez3D 2009 Plus software allowed the accurate measurement of bone lesions before and 3 months after treatment. The size changes of the periapical lesions and CBCT-PAI indices after endodontic treatment were assessed by recording mean values, minimum and maximal values were recorded for each slice.

A case selected from the study group is presented in figures 1.a-c (before treatment) and 2.a-c (3 months follow-up).

<table>
<thead>
<tr>
<th>CBCT-PAI</th>
<th>CAP size</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBCT-PAI 1</td>
<td>0.5-1mm</td>
</tr>
<tr>
<td>CBCT-PAI 2</td>
<td>1-2mm</td>
</tr>
<tr>
<td>CBCT-PAI 3</td>
<td>2-4mm</td>
</tr>
<tr>
<td>CBCT-PAI 4</td>
<td>4-8mm</td>
</tr>
<tr>
<td>CBCT-PAI 5</td>
<td>&gt;8mm</td>
</tr>
</tbody>
</table>

**Figures 1.a-c. S.L., age 38. Chronic apical periodontitis 1.6. (before treatment)**

**Figures 2.a-c. S.L., age 38. Chronic apical periodontitis 1.6. (3 months follow-up)**

**RESULTS**

The figures 3 and 4 present the distribution of CBCT-PAI indices before the non-surgical endodontic treatment of the chronic apical periodontitis and the changes of CBCT-PAI indices 3 months after treatment. The distribution of CBCT-PAI indices before treatment was as follows: 9 dental roots with CBCT-PAI 3, 7 dental roots with CBCT-PAI 4, and 4 dental roots with CBCT-PAI 5. After 3 months of non-surgical endodontic
The distribution of CBCT-PAI indices was as follows: 7 dental roots with CBCT-PAI 2, 5 dental roots with CBCT-PAI 3, 5 dental roots with CBCT-PAI 4, and 3 dental roots with CBCT-PAI 5.

The changes of CBCT-PAI indices in relation to the healing processes are presented in figure 6. Thus 77% from the dental roots changed CBCT-PAI 3 in CBCT-PAI 2, and 43% from the dental roots changed CBCT-PAI 4 in CBCT-PAI 3 revealing partial periapical healing. Also 25% from the dental roots with severe chronic periapical lesions changed CBCT-PAI 5 in CBCT-PAI 4.

Tables 2 and 3 present the sizes (measured on CBCT) of the chronic apical periodontitis in the bucal-oral, coronal-apical, and mesio-distal sections. It were included the mean values, the lowest, and the highest dimension for each investigated sections. The pre-treatment sizes for the buccal-oral slices were as follows: 7.02 mm mean value, 2.56 mm minimum value, 16.50 mm maximum value. The pre-treatment sizes for the coronal-apical slices were as follows: 7.46 mm mean value, 3.70 mm minimum value, 21.90 mm maximum value. The pre-treatment sizes for the mesio-distal slices were as follows: 7.62 mm mean value, 2.80 mm minimum value, 21.00 mm maximum value. The post-treatment sizes for the buccal-oral slices were as follows: 4.86 mm mean value, 2.00 mm minimum value, 11.10 mm maximum value. The post-treatment sizes for the corono-apical slices were as follows: 5.98 mm mean value, 2.60 mm minimum value, 17.20 mm maximum value. The post-treatment CBCT dimensions for the mesio-distal slices were as
follows: 6.61 mm mean value, 1.90 mm minimum value, 19.70 mm maximum value. The percentage of the sizes’ decrease of the chronic apical periodontitis, 3 months after non-surgical endodontic treatment, is 30.80% for buccal-oral slices (B-O), 19.80% for coronal-apical (C-A) slices and 13.30% for mesial-distal (M-A) slices (Fig. 6).

Table 2. The sizes (mm) of CAP pre-treatment

<table>
<thead>
<tr>
<th></th>
<th>B-O</th>
<th>C-A</th>
<th>M-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>16.50</td>
<td>21.90</td>
<td>21.00</td>
</tr>
<tr>
<td>Lowest</td>
<td>2.56</td>
<td>3.70</td>
<td>2.80</td>
</tr>
<tr>
<td>Mean values</td>
<td>7.02</td>
<td>7.46</td>
<td>7.62</td>
</tr>
</tbody>
</table>

Table 3. The sizes (mm) of CAP 3 months post-treatment

<table>
<thead>
<tr>
<th></th>
<th>B-O</th>
<th>C-A</th>
<th>M-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>11.10</td>
<td>17.20</td>
<td>19.70</td>
</tr>
<tr>
<td>Lowest</td>
<td>2.00</td>
<td>2.60</td>
<td>1.90</td>
</tr>
<tr>
<td>Mean values</td>
<td>4.86</td>
<td>5.98</td>
<td>6.61</td>
</tr>
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</table>

DISCUSSIONS

The literature data related to studies using CBCT, regarding the success rate in the non-surgical endodontic therapy of chronic apical periodontitis, offer various results due both to the different distribution of initial extent of the chronic apical periodontitis, different techniques and materials used and different times of follow-up. Considering the studies that compare CBCT images with histological results, CBCT images represent the “true” status of periapical tissues both before treatment and after treatment [5]. The results of our study show the partial healing of the chronic periapical lesions after non-surgical endodontic treatment, with a prevalence of the healing reactions of 77% for CAP with CBCT-PAI 3, 43% for CAP with CBCT-PAI 4, and 25% for CAP with CBCT-PAI 5. For the entire study group, partial healing was observed at 3 months follow-up in 65% cases, with higher percents (77%) for teeth with CBCT-PAI 3. Also CBCT examen allowed the recording of the sizes’ decrease of the chronic apical periodontitis. Different research groups demonstrated the effectiveness of CBCT in the follow-up of the post-treatment changes of the chronic apical periodontitis sizes [6,7,8]. Estrela et al. (2014) demonstrated that, 10 months after the endodontic treatment, 54% teeth with chronic periapical granuloma presented complete periapical healing on CBCT images, while 19% were associated with partial healing [9]. Patel S et al (2012), using CBCT, detected at 1 year follow-up 73.9% complete healing rate healing (the absence of periapical radiolucency) and 89.4% rate healing if the group with reduced size of periapical radiolucency was included [10]. Van Borden et al (2013) found 1 year posttreatment the complete healing of chronic apical periodontitis on CBCT images in only 16% cases [11]. Zhang M.M. et al. (2015) found, in a CBCT study, that 63% from the teeth with partial healing 1 year post-treatment continued the healing process in the next year, and in 33% cases the volume of the periapical lesion remained stable [12]. Our results sustain the recommendations of Estrella et al (2014) that considered a follow-up of minimum 1 year to record further reduction of the CAP sizes and complete periapical healing [13].

CONCLUSIONS

CBCT diagnostic and the follow-up of the results in the case of the non-surgical endodontic therapy of the chronic apical periodontitis is a reliable tool that must be considered for an extended use in the endodontic field. The short term follow-up using CBCT, despite of its limitations, can reveal the teeth with great potential for a successful endodontic treatment.
REFERENCES