INTRODUCTION

From the very beginning of the NiTi rotary instrumentation, more than a decade ago, numerous in vitro studies have evaluated the different properties of these instruments. A 1999 two-stage study that used a cross-perspective design to compare the endodontic treatment made by students led to the conclusion that, in the case of curved canals, the curvature is better maintained during treatment if a manual technique and NiTi instruments are used compared to Kerr stainless steel files. Furthermore, this study demonstrated the existence of a relation between the incidence of procedural accidents and a delayed healing process. However, information related to the clinical results of NiTi instrumentation is rather limited.

AIM OF THE STUDY

The aim of the study was to compare the performance of two NiTi rotary instrument systems, Lightspeed® and ProFile®, with respect to the presence or absence of periapical lesions, as assessed with the PAI (Peri Apical Index) score.

MATERIAL AND METHODS

The patients included in the study signed for acceptance of the study plan: rotary treatment and root canal obturation of the selected teeth, examination and X-ray three months after the treatment. The selection criteria were: patients who accepted to comply with the post-treatment study plan. Patients with diabetes or an immunocompromising disease were excluded from the study. Patients were randomly assigned to

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Received for publication: Feb. 22, 2008. Revised: May 19, 2008.
three treatment groups. The groups A, B and C were treated in turn, i.e. the first patients that arrived to the clinic were assigned to group A, the next patient was assigned to group B etc. The groups were treated as follows:

- Group A was treated using the Lightspeed® system (Lightspeed Inc., San Antonio TX, USA)
- Group B was treated using the ProFile® .04 system (Densply Maillefer, Ballaigues, Switzerland)
- Group C was treated using a hybrid-technique using the ProFile .04 and ProFile .06 instruments.

The operative protocol included:
1. Creating a sterile operating area by mounting the rubber dam;
2. Creation of the access cavity;
3. Evacuation of the pulp chamber;
4. Detection of the root canal openings;
5. Removal of the root canal pulp;
6. Setting the working length;
7. Mechanical root canal preparation;
8. Disinfection and canal drying;
9. Root canal obturation;

All treated teeth underwent retroalveolar radiographic examination at baseline (before the root canal treatment) and three months after. All patients were included in a reexamination diagram at three months and one year post-treatment. During these post-operative examinations, radiographs were taken. (Figs. 1-5) The radiographs were evaluated according the criteria imposed by Ørstavik (1991) and each radiograph was assigned a PAI (Peri Apical Index) score.3,4

The PAI index was defined by Ørstavik (1991) as follows:3,4
- PAI 1 is assigned to normal apical periodontium;
- PAI 2 refers to bone structural changes indicating, but non pathognomonic for, apical periodontitis;
- PAI 3 refers to cases with bone structural changes with some mineral loss characteristic of apical periodontitis;
- PAI 4 indicates a well defined radiolucency;
- PAI 5 indicates a lucency with radiating expansions of bone structural changes.

Statistical analysis
As PAI scores represent non-continuous data, nonparametric tests and descriptors were used to analyze the data. For the “healthy/diseased” analysis, the PAI data were dichotomized with PAI scores 1 and 2 (for “healthy periapex”) and scores from 3 to 5 (for “diseased periapical tissues”).
Figure 3. Case 3: a. Pre-treatment PAI score: PAI 1; b. 3 months post-treatment PAI score: PAI 1.

Figure 4. Case 4: a. Pre-treatment PAI score: PAI 2; b. 3 months post-treatment PAI score: PAI 1.

Figure 5. Case 5: a. Pre-treatment PAI score. A thorough examination of the case and of the radiograph resulted in the assignment of score PAI 1; b. 3 months post-treatment PAI score: PAI 1.

RESULTS

Table 1 and Figure 6 are presenting the demographic distribution of patients included in the study. The average age was 41.9 ± 1.34 years, with no significant difference between genders.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-30</td>
<td>15</td>
<td>18</td>
<td>33</td>
</tr>
<tr>
<td>31-50</td>
<td>43</td>
<td>54</td>
<td>97</td>
</tr>
<tr>
<td>51-70</td>
<td>21</td>
<td>23</td>
<td>44</td>
</tr>
<tr>
<td>71-90</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>81</td>
<td>98</td>
<td>179</td>
</tr>
</tbody>
</table>

Table 2 present the distribution of the treated teeth between groups A, B and C.

Table 3 and Figure 7 represent the initial PAI score distribution for the treated teeth in groups A, B and C.

Table 4 represents the cases with the PAI index as modified after the first evaluation, in relation with techniques used for root canal preparation.
RESULTS

Table 1 and Fig. 6 represent the demographic data of the study group (n=179). The average age was 41.9±1.34 years, with a distribution of patients included in the study group as follows: 11-30 years: 15 (8.4%), 31-50 years: 43 (23.8%), 51-70 years: 54 (30.2%), and 71-90 years: 21 (11.6%).

Table 2. The teeth group distribution in groups A, B and C (n=268).

<table>
<thead>
<tr>
<th>PAI Score</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19</td>
<td>50</td>
<td>49</td>
<td>118</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
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<td>13</td>
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<td>3</td>
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<td>11</td>
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</tr>
<tr>
<td>4</td>
<td>15</td>
<td>26</td>
<td>37</td>
<td>77</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

A study performed over the last thirty years on different population groups suggests a rate of treatment failure between 30 and 60%.

Table 4. The number of cases with PAI index different at the last examination from the first evaluation, distributed according to the technique used in the groups A, B, and C (n=233).

<table>
<thead>
<tr>
<th>PAI / group</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>12</td>
<td>12</td>
<td>23</td>
<td>47</td>
</tr>
<tr>
<td>-2</td>
<td>3</td>
<td>10</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>-1</td>
<td>7</td>
<td>11</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>0</td>
<td>21</td>
<td>52</td>
<td>51</td>
<td>124</td>
</tr>
<tr>
<td>+1</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>+2</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>+3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

DISCUSSIONS

Generally, the results of endodontic treatments raised a high degree of interest during the last century of practice of endodontics. However, the methodology used still causes problems in the evaluation and assessment of the available data and results.
obturation in relation to the radiographic apex did not affect the outcome of this study. This conclusion is in accordance with similar studies from Sjögren et al and Kojima et al, and with the recent radiographic analysis by Hoskinson et al, and Huumonen et al. A plausible explanation could be that it is not the extruded obturation material that is responsible for the persistence of the infection, but the infected dentin debris remained in the canal. Thus, the long-time prognosis of a tooth that underwent a root canal treatment is not determined only by its healing rate.

CONCLUSIONS

1. In spite of the many limitations, the present study is one of the few clinical reports that evaluate the performances of rotary NiTi instruments in root canal preparations, as assessed with the PAI score. The PAI score did not show large variations related to the technique, preparation technique or the obturation method.

2. The variable that influenced the outcome of the treatment observed in this study was the presence or absence of initial periapical lesions, as assessed by the PAI score.

3. Rotary instrumentation is a big step ahead in the development of canal preparation. A better apical preparation, as one of the targets of a successful endodontic therapy, is now possible using the latest generations of rotary NiTi instruments.

REFERENCES