Abstract

The main iatrogenic effects associated with orthodontic treatment refer to: influence of orthodontic rings on the periodontal tissue; gum retractions; the effect of the orthodontic treatment on dental root (root resorption); the effect of the orthodontic treatment on alveolar bone height; mobility and pain associated with orthodontic treatment.

AIM of the study: To assess the degree of root resorption of incisors, after orthodontic treatment, on a group of 48 adults with dental-maxillary abnormalities.

Materials and method: The study included 48 young adult patients, 35 women and 13 men aged 18 to 30 years, who had received fixed orthodontic treatment. To assess the degree of root resorption (changes at root level and apical contour length), apical radiographies were taken in the maxillary incisors and jaw both at the beginning and end of the orthodontic treatment.

Results: Out of the 239 incisors examined at the beginning of orthodontic treatment, 163 showed code 0, meaning 88.1%, and 50 showed a slight squash apex (code 1), respectively 10.9%. Only 1% of all incisors assessed presented mild and severe root resorption.

Conclusions: The results of the study show that, generally, an adult orthodontic treatment, applied for functional and aesthetic objectives, may have clinically acceptable iatrogenic effects.

Keywords: orthodontic treatment, incisor, root resorption

INTRODUCTION

Making a treatment plan for an adult patient is often a challenge for the orthodontist because, even if adults are more compliant, they often have periodontal problems, teeth with abrasion / attrition restorations well / poorly made, missing teeth, different spacing and other periodontal and restorative deficiencies, which may compromise the final result of the treatment [1-4]. Therefore, currently, the number of adult patients seeking for orthodontic treatment is increasing. In some cases, 30 to 40% of the patients have ages over 25 years.

Besides, the prophylactic actions of the orthodontic treatment for periodontal problems should not leave aside its opposite side, namely the iatrogenic action of this therapy on the periodontal tissue [5-10]. The main iatrogenic effects associated with orthodontic treatment are: the influence of the orthodontic rings on the periodontal tissue; gum retraction; the effect of orthodontic treatment on dental root (root resorption); the effect of orthodontic treatment on alveolar root height; mobility and pain associated with orthodontic treatment [8-10].

AIM OF THE STUDY

To assess the degree of root resorption of incisors after orthodontic treatment on a group of 48 adults with dental-maxillary abnormalities.

MATERIALS AND METHOD

The study group, including 48 young adult patients (35 women and 13 men, aged 18 to 30 years), received fixed orthodontic treatment, according to the following criteria:

- Minimum age of 18 years when beginning the orthodontic treatment;
- Lack of dental and periodontal diseases at the beginning of the orthodontic treatment;
- Lack of maxilla-facial trauma within history;
- Acceptance of orthodontic treatment with fixed appliances, straight-wire technique for a period of 12-24 months, with an average of 19 months.

In the group of 48 patients, dental-maxillary abnormalities were evidenced, as follows:
25 patients – Class I Angle, 11 patients – Class II / 1 Angle, 10 patients – Class II / 2 Angle, 2 patients – Angle Class III classification, respectively.

A total number of 40 patients were treated after extractions for orthodontic purposes, as follows: 4 extractions of first premolars were made in 4 patients, of upper second premolars in 20 patients, and of 2 upper first premolars and 1 incisor lower central at 6 patients, of the lower central incisor in 5 patients, other combinations of extractions in 5 patients. 48 patients suffered no extractions for orthodontic purposes.

Teeth that had received previous endodontal treatment were excluded from the study.

To assess the degree of root resorption (changes of root length and of apical contour), apical radiographs were made, at the beginning and end of the orthodontic treatment, to the upper and lower incisors.

The degree of root resorption was assessed for each incisor in part, based on the classification of Kalley and Philips (1991), using the following codes:

Table 1

<table>
<thead>
<tr>
<th>Number of lateral upper incisors – 158</th>
<th>Degree of root resorption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment code</td>
<td>Aftercare code</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>133</td>
<td>19</td>
</tr>
</tbody>
</table>

**RESULTS**

The severity degree of root resorption was evaluated at the beginning and end of the orthodontic treatment in the central and lateral, upper and lower incisors.

The data listed in the tables evidence the emergence of fourth apical root resorption after orthodontic treatment and, in particular, the slight bluntness of the root apex.

Severe resorptions, interesting more than a quarter of roots’ length, have a low incidence.

Tables 2 and 3

<table>
<thead>
<tr>
<th>Number of central upper incisors – 166</th>
<th>Degree of root resorption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment code</td>
<td>Aftercare code</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>123</td>
<td>43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of central upper incisors – 155</th>
<th>Degree of root resorption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment code</td>
<td>Aftercare code</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>150</td>
<td>5</td>
</tr>
</tbody>
</table>

Fig. 1. Clinical aspect of orthodontic treatment application

Fig. 2. Radiological aspects assessing the degree of root resorption before and during application of orthodontic treatments
The present study confirms that the upper incisors are the most susceptible ones to root resorption, which agrees with other literature data [7,10-14]. The incidence and severity of root resorption registered in other studies are quite difficult to be compared, as different techniques and methods had been employed [2,3,16,17]. The percents recorded in the present investigation are of 1% for incisors with mild and severe resorption prior to orthodontic treatment, and of 14.7% (13.3 and 1.4%), respectively, at the end of treatment, for the same indices. Only 9 of the total number of 639 incisors evaluated at the end of the care treatment showed degree 3 for root resorption (more than a quarter of root length). 11 of the patients in the study required extraction of the lower central incisor for orthodontic purposes; assessment – by apical X-rays – of the remaining lower incisors at the end of the fixed orthodontic treatment showed code 0 for most of tooth root resorption.

Root resorption associated with orthodontic treatment is a phenomenon often encountered, yet local mechanisms for preventing this process are available [5,6,14,15]. The root structure factors which may prevent resorption are represented by:

- Anti-angiogenic properties of cement (inhibition of blood vessels by adjacent cement formation and limiting the access of osteoclasts involved in resorption);
- Denser insertion of periodontal fibers in cement versus the alveolar bone, which reduces the access of osteoclasts to the cement layer;
- High hardness of cement and its high degree of mineralization;
- Cement repair through a tissue whose composition intermediates the bone-cement structure [14-19].

Out of the 239 examined incisors at the beginning of the orthodontic treatment, 163 showed code 0, *i.e.* 88.1%, and 50, *i.e.* 10.9%, showed a slight squash apex (code 1). Only 1% of all examined incisors showed mild and severe root resorption (codes 2 and 3).
The absence of root resorption of incisors was recorded for 135 teeth, which represents a rate of 36.7%.

Severe root resorption occurred only in 9 incisors, i.e. 1.4% of the total number of 639 examined incisors.

CONCLUSIONS

Root resorption is a plural-factorial phenomenon that primarily affects the upper and lateral incisors, and also the teeth with propensity to form specific root.

The results of the study show that, generally, an adult orthodontic treatment, applied for functional and aesthetic objectives, may have clinically acceptable iatrogenic effects.

Radiological examination usually reveals distal and medial resorptive defects and not vestibular and oral ones.

In the absence of plaque and by the application of physiological orthodontic forces, no associated iatrogenic effects occur.

References