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ORIGINAL RESEARCH

Comparative evaluation of apical root resorption during orthodontic treatment

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ABSTRACT:

Background: The present study was conducted to assess apical root resorption after orthodontic treatment. **Materials & Methods:** 20 patients requiring orthodontic treatment were divided into two groups. Each group had 10 patients. Group I patients received treatment with conventional fixed orthodontic appliances. Group II patients received treatment with the removable orthodontic appliances. ARR on each tooth was calculated as the difference of tooth length before and after orthodontic treatment. **Results:** Root resorption in maxillary central incisor was 70.2% in group I and 84.5% in group II. Maxillary Lateral Incisor had 69.7% in group I and 87.2% in group II, maxillary canine had 46.8% in group I and 80.4%, mandibular central incisor had 62.4% group I and 76.2% in group II, mandibular lateral incisor had 54.7% in group I and 87.2% in group II and mandibular canine had 57.1% in group I and 82.9% in group II. The mean ARR in maxillary central incisor was 0.27 and 1.24, at maxillary lateral incisor was 0.24 and 1.32, at maxillary canine was 0.15 and 1.52, mandibular central incisor was 0.20 and 0.64, at mandibular lateral incisor was 0.06 and 1.04 and at mandibular canine was -0.07 and 1.04 in group I and II respectively. The difference was significant ($P < 0.05$). **Conclusion:** Fixed appliances resulted in less apical root resorption as compared to removable appliances.

Key words: Removable appliances, fixed appliances, Root resorption

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INTRODUCTION

Apical root resorption (ARR), a permanent loss of hard tissue on the root apex of a tooth, is one of the most undesirable side effects during orthodontic treatment. The prevalence of ARR varies from 20 to 100% among orthodontic patients. Severe ARR is rare with an incidence between 1 and 5% but the resorption can be more than 5 mm or one-fourth of root length. ARR can cause an imbalanced ratio of crown and root in the affected teeth, and even teeth loss, affecting patients' quality of life and orthodontic treatment result.

The duration of orthodontic treatment may vary according to the severity of the case. Decreasing the average 24-month treatment time has become an important area for clinicians and researchers. During the last decade, several strategies for accelerating the

orthodontic treatment have been proposed. These included chemical agents, physical stimulants, and surgical procedures. Surgical selective decortication of the alveolar bone to shorten the duration of orthodontic treatment has been used since the 1950s.¹

Even though fixed appliances have been the mainstream for orthodontic treatment, removable orthodontic appliances also find a place in day to day orthodontic practice. Removable orthodontic practice does occupy a significant place in developing countries and in patients requiring less comprehensive orthodontic treatment. Also the practical ease with removable orthodontic treatment makes it at times feasible while catering to the orthodontic needs of a large population group. The present study was

conducted to assess apical root resorption after removable and fixed orthodontic treatment.

MATERIALS & METHODS

The present study was conducted on 20 patients requiring orthodontic treatment of both genders. Data such as name, age, gender etc. was recorded. Patients were divided into two groups. Each group had 10 patients. Group I patients received treatment with fixed orthodontic appliances. Group II patients received treatment with the removable orthodontic appliances. Intra oral periapical radiographs were obtained at start and end of 6 month treatment period and the root length from the mid-point of the incisal edge/cusp to the apex was measured. ARR on each tooth was calculated as the difference of tooth length before and after orthodontic treatment. Results thus obtained were statistically analyzed. P value less than 0.05 was significant.

Table I: Distribution of subjects

Groups	Group I	Group II
Technique	Fixed orthodontic appliances	Removable orthodontic appliances
Number	10	10

Table I shows group I patients received treatment with clear aligners. Group II patients received treatment with the conventional fixed orthodontic appliances.

Table II, graph I shows that root resorption in maxillary central incisor was 70.2% in group I and 84.5% in group II. Maxillary Lateral Incisor had 69.7% in group I and 87.2% in group II, maxillary canine had 46.8% in group I and 80.4%, mandibular central incisor had 62.4% group I and 76.2% in group II, mandibular lateral incisor had 54.7% in group I and 87.2% in group II and mandibular canine had 57.1%

in group I and 82.9% in group II. The difference was significant (P< 0.05).

Table II Prevalence of apical root resorption in both groups

Teeth		Group I	Group II	P value
Maxillary Incisor	central	70.2%	84.5%	0.04
Maxillary Incisor	Lateral	69.7%	87.2%	0.01
Maxillary canine		46.8%	80.4%	0.05
Mandibular incisor	central	62.4%	76.2%	0.02
Mandibular incisor	lateral	54.7%	87.2%	0.04
Mandibular canine		57.1%	82.9%	0.01

Table III shows that mean ARR in maxillary central incisor was 0.27 and 1.24, at maxillary lateral incisor was 0.24 and 1.32, at maxillary canine was 0.15 and 1.52, mandibular central incisor was 0.20 and 0.64, at mandibular lateral incisor was 0.06 and 1.04 and at mandibular canine was -0.07 and 1.04 in group I and II respectively. The difference was significant (P< 0.05).

DISCUSSION

Apical root resorption (ARR) during orthodontic treatment is prevalent and negatively affects patients' quality of life and orthodontic treatment result. The present study was conducted to assess apical root resorption during orthodontic treatment.

Graph I Prevalence of apical root resorption in both groups

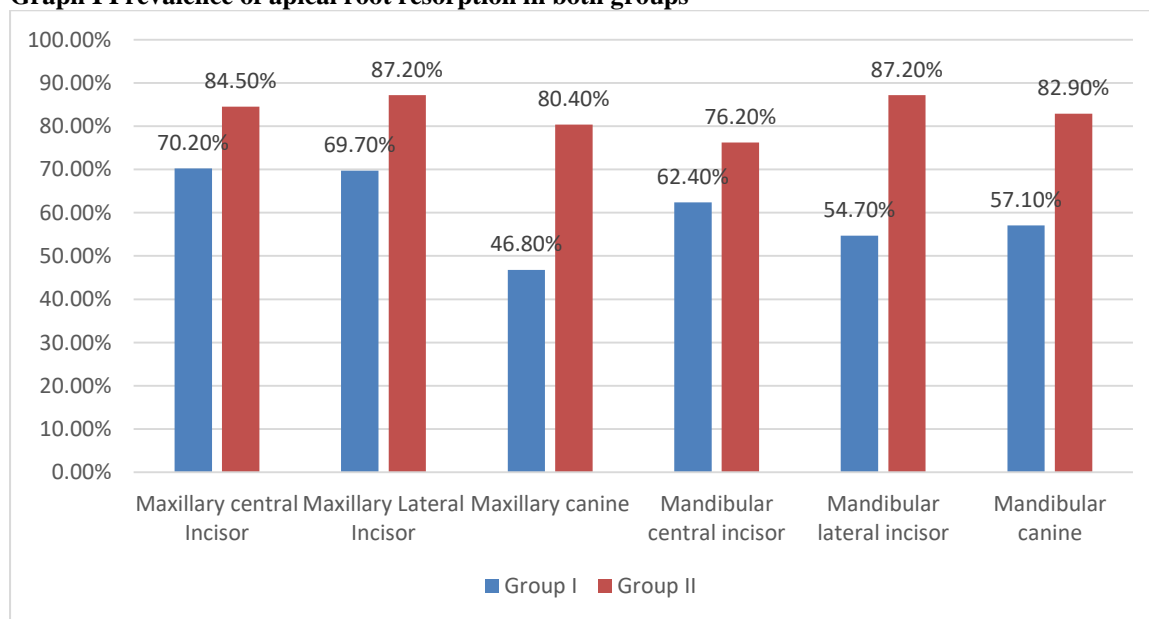


Table III Assessment of Severity of apical root resorption in both groups

Teeth		Group I	Group II	P value
Maxillary Incisor	central	0.27	1.24	0.04
Maxillary Incisor	Lateral	0.24	1.32	0.01
Maxillary canine		0.15	1.52	0.02
Mandibular incisor	central	0.20	0.64	0.05
Mandibular incisor	lateral	0.06	1.04	0.01
Mandibular canine		-0.07	1.04	0.01

In present study, group I patients received treatment with fixed orthodontic appliances. Group II patients received treatment with the removable orthodontic appliances. We found that root resorption in maxillary central incisor was 70.2% in group I and 84.5% in group II. Maxillary Lateral Incisor had 69.7% in group I and 87.2% in group II, maxillary canine had 46.8% in group I and 80.4%, mandibular central incisor had 62.4% group I and 76.2% in group II, mandibular lateral incisor had 54.7% in group I and 87.2% in group II and mandibular canine had 57.1% in group I and 82.9% in group II. Freitas et al¹¹ evaluated the frequency of apical root resorption (ARR) after orthodontic treatment at 52-288 months using periapical radiography (PR) and cone beam computed tomography (CBCT). Radiographic images obtained from 58 patients, before (T1) and after orthodontic treatment (T2), and following 52-288 months of treatment were analyzed by three members of the Brazilian Board of Orthodontics. Apical structures were evaluated by PR images (T2 and T3), using Levander and Malmgren scores. The more frequent ARR were with scores 1 in T2 (51.6%) and T3 (53.1%), when evaluated by PR ($p > 0.05$). When compared the frequencies of ARR in T3 among PR and CBCT images, the differences were significant for maxillary and mandibular premolar groups, and for mandibular molar group ($p > 0.05$). The teeth with highest frequency of ARR presence using CBCT images were maxillary lateral incisors (94.5%) and mandibular central incisors (87.7%), while the premolars showed the lowest frequency. The CBCT images showed that the teeth involved in orthodontic treatment with extraction present higher ARR frequency ($p < 0.05$).

We found that mean ARR in maxillary central incisor was 0.27 and 1.24, at maxillary lateral incisor was 0.24 and 1.32, at maxillary canine was 0.15 and 1.52, mandibular central incisor was 0.20 and 0.64, at mandibular lateral incisor was 0.06 and 1.04 and at mandibular canine was -0.07 and 1.04 in group I and II respectively. Yuan et al¹² assessed the prevalence and severity of ARR in patients treated fixed appliances using cone beam computed tomography (CBCT). A total of 373 roots from 70 subjects, with similar baseline characteristics and the ABO

discrepancy index scores (i.e., treatment difficulty), were included. Root length of each anterior tooth was measured on the CBCT images by two blinded investigators. The ARR on each tooth was calculated as the difference of root length before and after orthodontic treatment. Prevalence of ARR with the fixed appliances was found to be (82.11%) ($P < 0.001$). The shortcoming of the study was small sample size and choice of investigation. CBCT is a much sensitive method of assessment of root resorption but has cost implications associated with it.

CONCLUSION

Authors found that fixed appliances resulted in less apical root resorption as compared to removable appliances during orthodontic treatment.

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