

## ORIGINAL RESEARCH

### Assessment of apical root resorption among patients undergoing orthodontic treatment

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#### ABSTRACT:

**Background:** External apical root resorption is an undesirable complication of orthodontic treatment. The present study was conducted to assess apical root resorption in patients undergoing orthodontic treatment. **Materials & Methods:** The present study was conducted on 124 patients undergoing orthodontic treatment of both genders. The degree of EARR was evaluated based on index proposed, using a 0-4 scale of severity, as follows: Score 0: Absence of changes in the root apex; Score 1: Irregular root contour; Score 2: EARR of less than 2 mm; Score 3: EARR from 2 mm to one-third of the original root length; Score 4: EARR exceeding one-third of the original root length. **Results:** Out of 124 patients, males were 50 and females were 74. Degree 1 root resorption was seen in 18 teeth followed by degree 2 in 16 teeth, degree 3 in 14 and degree 0 and 4 in 12 teeth. Maximum resorption was seen in 22 followed by 21. The difference was significant ( $P < 0.05$ ). **Conclusion:** External root resorption in orthodontic patients is common phenomenon. Degree 2 resorption was mostly seen in patients.

**Key words:** External root resorption, index, orthodontic

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#### INTRODUCTION

External apical root resorption (ARR) is an undesirable complication of orthodontic treatment, which results in permanent loss of tooth structure from the root apex. Previous studies have demonstrated a number of treatment-related factors that are significantly associated with the development of ARR in orthodontic patients, and led to the use of the term iatrogenic consequence.<sup>1</sup>

Root shortening results from a combination of complex biological activities in the region of the periodontal ligament, which will interact with force exerted during orthodontic treatment. Factors such as dental trauma prior to orthodontic treatment, bone density and morphology, shape of teeth roots, patient's age at orthodontic treatment onset, treatment duration, as well as orthodontic mechanics and magnitude of force have been reported as significant for the occurrence of EARR. Studies suggest that single nucleotide variations in human genome are also associated with development of ARR, suggesting that orthodontic treatment is not the only culprit.<sup>2</sup>

Even though there is no clinical practice guidelines on diagnosis, monitoring and management of root resorption,

understanding patient- and treatment related risk factors of this unwanted complication is of utmost importance to general dentists and orthodontists in the care of these patients. The most widely used diagnostic technique for root resorption remains conventional radiography including panoramic and periapical views. Newer imaging modalities, including 3-D Cone Beam Computed Tomography (CBCT), were recently introduced into clinical use and serve as attractive alternatives to conventional radiotherapy in diagnosis of ARR.<sup>3</sup> The present study was conducted to assess apical root resorption in patients undergoing orthodontic treatment.

#### MATERIALS & METHODS

The present study was conducted in the department of Orthodontics. It comprised of 124 patients undergoing orthodontic treatment of both genders. All were informed regarding the study and written consent was obtained. Ethical clearance was obtained prior to the study.

General information such as name, age, gender etc. was recorded. Tooth length was measured as the distance from the root apex tip to the midpoint of the incisal edge. Root

contour of maxillary and mandibular incisors assessed before and after treatment were compared. The degree of EARR was evaluated based on index proposed, using a 0-4 scale of severity, as follows: Score 0: Absence of changes in the root apex; Score 1: Irregular root contour; Score 2: EARR of less than 2 mm; Score 3: EARR from 2 mm to one-third of the original root length; Score 4: EARR exceeding one-third of the original root length. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

**RESULTS**

**Table I Distribution of patients**

Total- 124		
Gender	Males	Females
Number	50	74

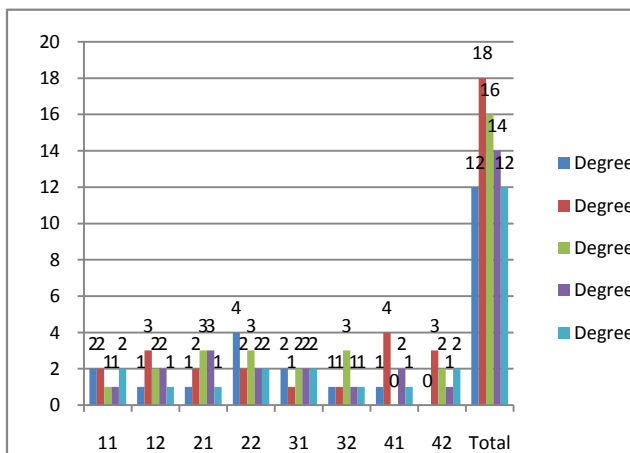
Table I shows that out of 124 patients, males were 50 and females were 74.

**Table II Prevalence of external root resorption**

Tooth	Degree 0	Degree 1	Degree 2	Degree 3	Degree 4	P value
11	2	2	1	1	2	0.01
12	1	3	2	2	1	0.02
21	1	2	3	3	1	0.51
22	4	2	3	2	2	0.01
31	2	1	2	2	2	0.02
32	1	1	3	1	1	0.03
41	1	4	0	2	1	0.01
42	0	3	2	1	2	0.05
Total	12	18	16	14	12	

Table II, graph I shows that degree 1 root resorption was seen in 18 teeth followed by degree 2 in 16 teeth, degree 3 in 14 and degree 0 and 4 in 12 teeth. Maximum resorption was seen in 22 followed by 21. The difference was significant (P < 0.05).

**Graph I External root resorption**



**DISCUSSION**

Growing lines of evidence suggest that genetic factors play a major role in the development of root resorption.<sup>4</sup> Genetic epidemiology defines heritability as the ratio of

genetic variance to total variance for a given trait, which represents the proportion of the phenotypic variance attributable to genetic factors. In a sibling pair study design, Harris et al.<sup>5</sup> estimated heritability for root resorption to be 80% for the maxillary incisors. In a separate retrospective twin study, phenotypic concordance for quantitative detection of root resorption was 49.2% in monozygotic twins compared to 28.3% in dizygotic twins with an estimated heritability of 34%. The present study was conducted to assess apical root resorption in patients undergoing orthodontic treatment.

In present study, out of 124 patients, males were 50 and females were 74. We found that degree 1 root resorption was seen in 18 teeth followed by degree 2 in 16 teeth, degree 3 in 14 and degree 0 and 4 in 12 teeth. The difference was significant (P < 0.05). We found that maximum resorption was seen in 22 followed by 21.

Levander et al<sup>6</sup> found that maxillary central incisors had the highest percentage of severe root resorption, followed by maxillary lateral incisors and mandibular lateral incisors. Out of 959 teeth, 28 (2.9%) presented severe root resorption. The following risk factors were observed: anterior maxillary teeth, overjet greater than or equal to 5 mm at treatment onset, treatment with extractions, prolonged therapy, and degree of apex formation at treatment onset.

Parker et al.<sup>7</sup> demonstrated, in 60 patients with impacted or ectopically erupting maxillary canines seeking orthodontic treatment, that there was a significant difference in root resorption rates obtained by CBCT versus panoramic radiograph in favor of CBCT. Taken together, these studies suggest that CBCT may be a more sensitive imaging modality for diagnostic and prognostic assessment of ARR. However, further studies are needed to assess safety and cost effectiveness of CBCT in the management of orthodontic patients with ARR.

Previous studies have shown that teeth subjected to orthodontic forces had significantly more ARR than the control teeth from the same subjects, suggesting that orthodontic forces have a significant role on the development of ARR, irrespective of patient-related factors. It has also been demonstrated that heavy forces induce significantly more ARR compared to light forces factors. This may be attributed, at least in part, to rapid lacuna development as well as compromised repair process observed with heavy force application.<sup>8,9</sup>

Liou et al<sup>10</sup> found differences in procedures used in routine clinical practice, such as the use of light forces and/or rest periods (discontinuous forces) every two to three months. Thus, groups of patients treated by different professionals, allied to the relatively recent advent of superelastic material enabling the use of light and progressive forces especially in the early stages of treatment, tend to show different final results.

**CONCLUSION**

Authors found that root resorption in orthodontic patients are common phenomenon. Degree 2 resorption was mostly seen in patients.

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