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Original Research

Apical root resorption in patients undergoing orthodontic treatment

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ABSTRACT:
Background: External root resorption is a feared complication during orthodontic procedures. The present study was conducted to assess apical root resorption in patients undergoing orthodontic treatment. **Materials & Methods:** 110 patients undergoing orthodontic treatment of both genders were selected. Tooth length was measured as the distance fromthe root apex tip to the midpoint of the incisal edge.Rootcontour of maxillary and mandibular incisors assessedbefore and after treatment were compared. The degree of EARR was evaluated
Results: Out of 110 patients, males were 50 and females were 60. Degree 1 root resorption was seen in 12 teeth followed by degree 2 in 20 teeth, degree 3 in 16 and degree 0 in 12 and degree 4 in 14 teeth. Maximum resorption was seen in 22. The difference was significant (P< 0.05).**Conclusion:** Degree 2 resorption was mostly seen in patients. Root resorption in orthodontic patients are common phenomenon.
Key words: External root resorption, orthodontic, Degree

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INTRODUCTION

External root resorption is a feared complication during orthodontic procedures. It can affect both the apex, but also the cervical zone of the roots subjected to orthodontic forces for tooth movement and can compromise the future of the involved teeth.Growing lines of evidence suggest that genetic factorsplay a major role in the development of root resorption.Genetic epidemiology defines heritability as the ratio ofgenetic variance to total variance for a given trait, whichrepresents the proportion of the phenotypic varianceattributable to genetic factors. In a sibling pair study design,Harris et al.[1] estimated heritability for root resorptionto be 80% for the maxillary incisors. In a separateretrospective twin study, phenotypic concordance forquantitative detection of root resorption was 49.2% inmonozygotic twins compared to 28.3% in dizygotic twinswith an estimated heritability of 34%.[2]

Root shortening results from a combination ofcomplex biological activities in the region of the periodontalligament, which will interact with force exerted during orthodontic treatment.[3]Factors such asdental trauma prior to orthodontic treatment, bonedensity and morphology, shape of teeth roots, patient'sage at orthodontic treatment onset, treatmentduration, as well as orthodontic mechanics and magnitude of force have been reported as significantfor the occurrence of EARR.[4] Studies suggest that singlenucleotide variations in human genome are alsoassociated with development of ARR, suggesting thatorthodontic treatment is not the only culprit.[2]The most widely used diagnostic technique for rootresorption remains conventional radiography includingpanoramic and periapical views.[5] Newer

imagingmodalities, including 3-D Cone Beam ComputedTomography (CBCT), were recently introduced into clinicaluse and serve as attractive alternatives to conventionalradiotherapy in diagnosis of ARR.[6] The present study was conducted to assess apical root resorption in patients undergoing orthodontic treatment.

MATERIALS & METHODS

The present study was conducted on110 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 fromthe root apex tip to the midpoint of the incisal edge.Rootcontour of maxillary and mandibular incisors assessedbefore and after treatment were compared.The degree of EARR was evaluated based on index proposed, using a 0-4 scale ofseverity, 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 ofthe original root length;Score 4: EARR exceeding one-third of theoriginal 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- 110		
Gender	**Males**	**Females**
Number	50	60

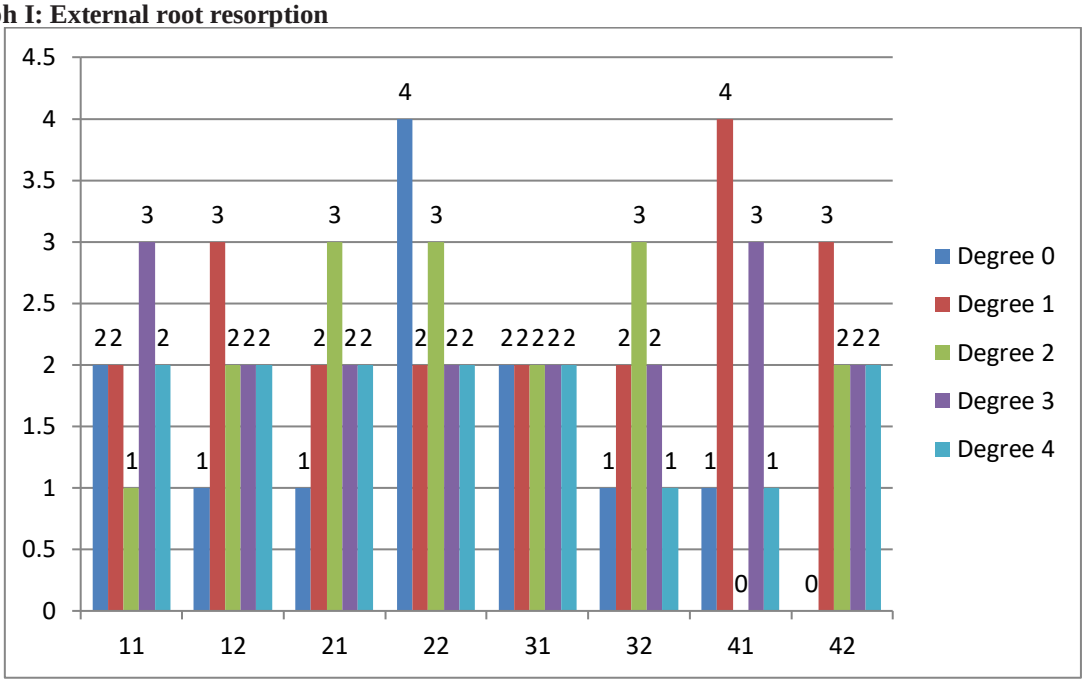
Table I shows that out of 110 patients, males were 50 and females were 60.

Table II: Degree of external root resorption

Tooth	Degree 0	Degree 1	Degree 2	Degree 3	Degree 4	P value
11	2	2	1	3	2	0.05
12	1	3	2	2	2	0.04
21	1	2	3	2	2	0.94
22	4	2	3	2	2	0.82
31	2	2	2	2	2	0.98
32	1	2	3	2	1	0.05
41	1	4	0	3	1	0.01
42	0	3	2	2	2	0.05
Total	12	20	16	18	14	

Table II, graph I shows that degree 1 root resorption was seen in 12 teeth followed by degree 2 in 20 teeth, degree 3 in 16 and degree 0 in 12 and degree 4 in 14 teeth. Maximum resorption was seen in 22. The difference was significant (P< 0.05).

Graph I: External root resorption



DISCUSSION

External apical root resorption (ARR) is an undesirablecomplication of orthodontic treatment, which results inpermanent loss of tooth structure from the root apex.[7] Previous studies havedemonstrated a number of treatment-related factors thatare significantly associated with the development of ARRin orthodontic patients, and led to the use of the termiatrogenic consequence.[8,9]The present study was conducted to assess apical root resorption in patients undergoing orthodontic treatment.

We found that out of 110 patients, males were 50 and females were 60.Liou et al[10] found differencesin procedures used in routine clinical practice, such asthe use of light forces and/or rest periods (discontinuousforces) every two to three months. Thus, groupsof patients treated by different professionals, allied tothe relatively recent advent of superelastic materialenabling the use of light and progressive forces especiallyin the early stages of treatment, tend toshow different final results.

We found that degree 1 root resorption was seen in 12 teeth followed by degree 2 in 20 teeth, degree 3 in 16 and degree 0 in 12 and degree 4 in 14 teeth. Maximum resorption was seen in 22. Parker et al[11] demonstrated, in 60 patients with impacted or ectopicallyerupting maxillary canines seeking orthodontic treatment,that there was a significant difference in root resorptionrates obtained by CBCT versus panoramic radiograph infavor of CBCT. Taken together, these studies suggest thatCBCT may be a more sensitive imaging modality fordiagnostic and prognostic assessment of ARR.

Levander et al[12] 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 severeroot resorption. The following risk factors were observed: anterior maxillary teeth, overjet greater than or equal to 5 mm attreatment onset, treatment with extractions, prolonged therapy, and degree of apex formation at treatment onset.

Segal et al[13] indicated that factors associated with the duration of active treatment might result in increased levels of ARR, and it was concluded that the apical displacement and total treatment duration proved to be highly correlated with the mean ARR. It was suggested that 2 to 3 month pauses in force, achieved with a passive arch wire,minimises further root resorption. Levander et al[14] showed that the amount of root resorption is significantly less in patients who are treated with such pauses than in those treated without an interruption. Acar et al[15] also indicated that the application of discontinuous force results in less root resorption than does the application of continuous force.

CONCLUSION

Authors found that degree 2 resorption was mostly seen in patients. Root resorption in orthodontic patients are common phenomenon.

REFERENCES

1. Haris, Brin I, Tulloch JC, Koroluk L, Philips C. External apical root resorption in Class II malocclusion: a retrospective review of 1- versus 2-phase treatment. Am J Orthod Dentofacial Orthop. 2003;124(2):151-6.
2. Montenegro VJ, Jones A, Petocz P, Gonzales C, Darendeliler MA. Physical properties of root cementum: Part 22. Root resorption after the application of light and heavy extrusive orthodontic forces: a microcomputed tomography study Am J Orthod Dentofacial Orthop. 2012;141(1):1-9.
3. Sameshima GT, Sinclair PM. Predicting and preventing root resorption: Part I.Diagnostic factors. Am J Orthod Dentofacial Orthop. 2001;119(5):505-10.
4. Artun J, Van'tHullenaar R, Doppel D, Kuijpers-Jagtman AM. Identification of orthodontic patients at risk of severe apical root resorption. Am J Orthod Dentofacial Orthop. 2009;135(4):448-55.
5. Bartley N, Türk T, Colak C, Elekdaq-Türk S, Jones A, Petocz P, et al. Physical properties of root cementum: Part 17. Root resorption after the application of 2.50 and 150 of buccal root torque for 4 weeks: a micro computed tomography study. Am J Orthod Dentofacial Orthop. 2011;139(4):353-60.
6. Mirabella AD, Artun J. Risk factors for apical root resorption of maxillaryanterior teeth in adult orthodontic patients. Am J Orthod Dentofacial Orthop.1995;108(1):48-55.
7. Killiany DM. Root resorption caused by orthodontic treatment: a review of literature from 1998 to 2001 for evidence. Prog Orthod2002;3:2-5.
8. Deng Y, Sun Y, Xu T. Evaluation of root resorption after comprehensive orthodontic treatment using cone beam computed tomography (CBCT): a meta-analysis. BMC Oral Health 2018;18;116.
9. Estrela C, Bueno MR, De Alencar AH, Mattar R, Valladares Neto J, Azevedo BC. Method to evaluate inflammatory root resorption by using cone beam computed tomography. J Endod2009;35:1491-497.
10. Liou EJW, Chang PMH. Apical root resorption in orthodontics patients with enmasse maxillary anterior retraction and intrusion with miniscrews. Am J Orthod Dentofacial Orthop. 2010;137(2):207-12.
11. Parker RJ, Harris EF. Directions of orthodontic tooth movements associated with external apical root resorption of the maxillary central incisor. Am J Orthod Dentofacial Orthop. 1998;114(6):677-83.
12. Levander E, Malmgren O. Evaluation of the risk of root resorption during orthodontic treatment: a study of upper incisors. Eur J Orthod. 1988;10(1):30-7.
13. Segal G, Shiffman P, Tuncay O. Meta analysis of the treatment related factors of external apical root resorption. Orthod Craniofacial Res. 2004;7:71–78.
14. Levander E, Malmgren O, Eliasson S. Evaluation of root resorption in relation to two orthodontic treatment regimes. A clinical experimental study. Eur J Orthod. 1994;16:223–228.

15. Acar A, Canyurek U, Kocaaga M, Erverdi N. Continuous vs. discontinuous force application and root resorption. Angle Orthod. 1999;69:159–164.