ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2023; 9(1): 08-11

www.oraljournal.com
Received: 03-10-2022
Accepted: 08-11-2022

Dr. Vallari Soni
Department of Orthodontics and Dentofacial Orthopedics, Gujarat University, Ahmedabad, Gujarat, India

Dr. Sonali Mahadevia
Department of Orthodontics and Dentofacial Orthopedics, Gujarat University, Ahmedabad, Gujarat, India

Corresponding Author:
Dr. Vallari Soni
Department of Orthodontics and Dentofacial Orthopedics, Gujarat University, Ahmedabad, Gujarat, India

Root resorption occuring during different modalities of orthodontic treatment: A research based study

Dr. Vallari Soni and Dr. Sonali Mahadevia

DOI: https://doi.org/10.22271/oral.2023.v9.i1a.1648

Abstract
In orthodontic treatment there are so many risk factors. In this factors one is the root resorption. Now a days there is not found any discussion on the onset, severity, and management of root resorption. For the stability of the dentition long term prognosis is require, it is an encouraging reason to identify causal factors than we can minimize the risk, and reduced the amount of root resorption. The aim of this study is To evaluate root resorption as a primary outcome for a population of patients who received orthodontic treatment, in order to give the best accessible evidence upon which clinical resolution can be made for root resorption to minimize the risk and severity. A randomized clinical trial involving human subjects for orthodontic tooth movement, with fixed appliances was carried out, and root resorption during or after treatment was recorded. Pre treatment and Post treatment panoramic radiographs of 60 subjects were taken. Patients were divided into 3 groups. One group had proclination and underwent all 4 extraction. Second group had crowding of teeth and underwent all 4 extraction. And third group were treated with non extraction. It was concluded that root resorption in extraction group is significantly greater when compared with non extraction group.

Keywords: Root resorption, extraction, non-extraction

Introduction
Apical root resorption is a common unknown problem with orthodontic treatment and now a days considerable attention because of medico legal exposure. Root resorption is unpredictable when extending into the dentin, and it is irreversible [1]. Many authors were found that the resorption of the root is seen in the orthodontic treatment. Especially in the extraction of the teeth in the orthodontic treatment the root resorption is seen.
previously root resorption in an orthodontics was a major concern. By the radiographic evidence, there is a differences between root shape before and after orthodontic treatment. And it is followed by a wide range of histologic, clinical, and physiologic study on root resorption and orthodontic treatment. In the deciduous dentition root resorption is a normal, essential, and physiologic process for the eruption of the permanent teeth. Some deciduous teeth, even with agenesis of the succedaneous teeth, undergo root resorption [4]. Root resorption of the permanent teeth is still unclear due to the complex biologic process. There is a three external root resorption types: surface resorption, it is a self-limiting process, involving small outlining areas and spontaneous repair from adjacent intact parts of the periodontal ligament; inflammatory resorption, it is initial root resorption has reached dentinal tubules of an infected necrotic pulpal tissue or an infected leukocyte zone; and replacement resorption, where bone replaces the resorbed tooth material that leads to ankyloses [2].
Root resorption after orthodontic treatment is surface resorption, or transient inflammatory resorption. Replacement resorption is rarely if ever seen after orthodontic treatment [5-6]. Age of the patient, gender, nutrition in routine life, genetics, the appliance type, the amount of force used during treatment, wether it is extraction or non-extraction, time span of treatment, and the distance the teeth are moved all have some in affected on root resorption. Generally, the causes and mechanism of resorption are still unclear [3].

Materials and Methods

To evaluate factors related to root resorption before and after orthodontic treatment.

To research root resorption during orthodontic treatment and its correlation between : A. Gender B. Extraction proclination and non extraction group C. Extraction crowding and non extraction group D. Extraction proclination and extraction crowding group.

Pretreatment and Post treatment panoramic radiographs of 60 subjects were selected according to inclusion & exclusion criterias described below. Panoramic radiographs of the patients for the purpose of study were selected after screening 200 subjects, obtained from the patient records of the Department of Orthodontics and Dentofacial Orthopaedic.

Panoramic radiograph was used. Patients were divided into 3 groups. One group had patients who had proclination and underwent all 4 extraction. Second group had patients who had crowding of teeth and underwent all 4 extraction. And third group had patients who were treated with non extraction. The roots of the maxillary and mandibular incisors, canines, premolars, and rst molars were examined according to a modified root resorption classification method, based on the root resorption score. Panoramic radiographs were used to score the root resorption level for every patient at pre treatment T1 and post treatment T2. The mean root resorption score (MRRS) for every patient at T1 and T2 was calculated for the upper anterior and posterior and lower. anterior and posterior teeth, using the formula: Mean root resorption = Sum of the scores / Number of teeth Gender, age, extraction or non-extraction therapy, and treatment duration were recorded. The degree of root resorption was evaluated by one author from pre and post-treatment panoramic radiographs Statistical analysis included : 1. One way anova test 2. Anova test 3. Post Hoc test 4. Independent sample t test. The following criteria were included for selection of subjects : 1. Patient aged 12-32 years. 2. Patients in whom root formation is complete. 3. Absence of periapical pathology. 4. Teeth with healthy periodontal status. 5. The teeth has not undergone any restorative procedures. 6. Atleast underwent 1 year of fixed appliance therapy. And the exclusion criteria is: 1. All panoramic radiographs in which the roots were distorted and not clearly visible were rejected.2. Subjects with craniofacial anomalies like cleft lip and palate and syndromes were not included in the study 3. Patients who required orthognathic surgery 4. Edentulous spaces or mixed dentition cases 5. History of trauma to dentofacial region 6. Individuals with marked jaw asymmetries and TMJ abnormalities were excluded from the study 7. Significant cuspal wear 8. Extensive restorations or prosthetics 9. Patients on continuous medication. 10.Metal restorations. 11.Bruxism. 12.Previous history of orthodontic treatment [3].

Results

Table 1: Mean root resorption score of all the three groups

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Extraction Proclination	30	1.687	0.318	0.058	1.568	1.805	1.200	2.400
Extraction crowding	30	1.633	0.247	0.045	1.541	1.725	1.200	2.000
non extraction	30	1.360	0.285	0.052	1.254	1.466	1.000	2.000
Total	90	1.560	0.316	0.033	1.494	1.626	1.000	2.400

Table 2: Significance of root resorption between all the three groups

	Sum of Squares	df	Mean Square	F	ANOVA P Value
Between Groups	1.843	2	.921	11.364	.000
Within Groups	7.053	87	.081		
Total	8.896	89			

Table 3: Intergroup significance of root resorption

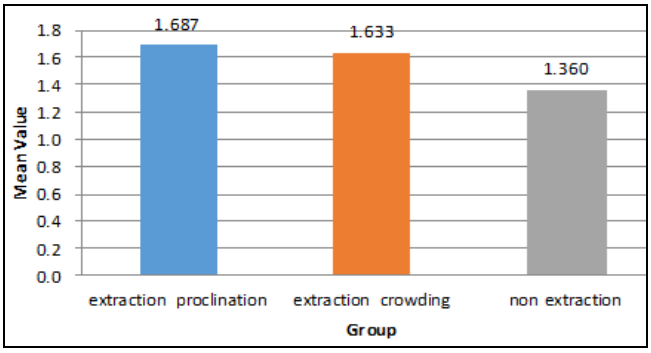
(I) Group		Mean Difference (I-J)	Std. Error	P-Value	95% Confidence Interval	
					Lower Bound	Upper Bound
extraction proclination	extraction crowding	.053	.074	.749	-.122	.229
extraction proclination	non extraction	.327	.074	.000	.151	.502
extraction crowding	non extraction	.273	.074	.001	.098	.449

Table 4: Significance of root resorption between genders

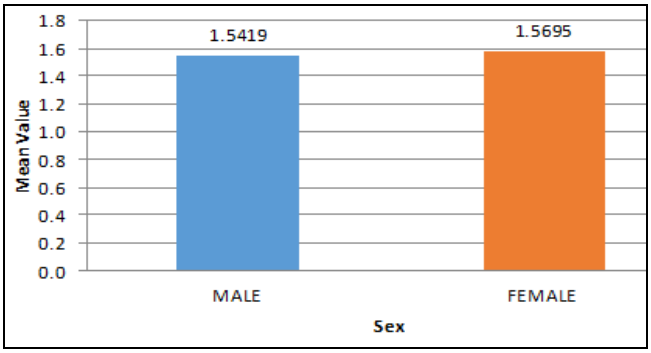
Sex		N	Mean	Std. Deviation	Std. Error Mean	P Value
Data mean	Male	31	1.5419	.32329	.05806	.697
	Female	59	1.5695	.31473	.04097	

Table 5: Intergroup significance of root resorption between genders

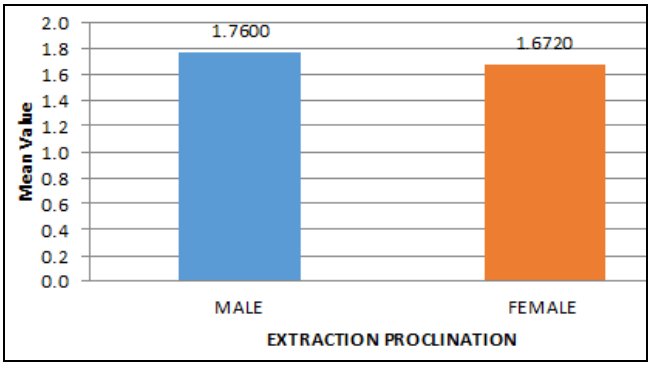
Group	Sex	N	Mean	Std. Deviation	Std. Error Mean	P Value
Extraction proclination	Male	5	1.7600	.32863	.14697	.581
	Female	25	1.6720	.32083	.06417	
Extraction crowding	Male	12	1.6000	.24121	.06963	.555
	Female	18	1.6556	.25489	.06008	
Non-extraction	Male	14	1.4143	.34609	.09250	.338
	Female	16	1.3125	.21871	.05468	



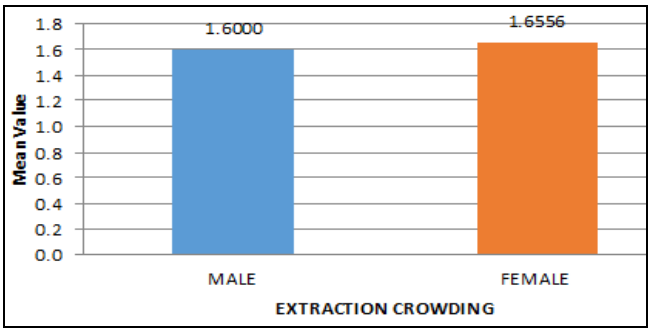
Graph 1: Inter group significance of root resorption



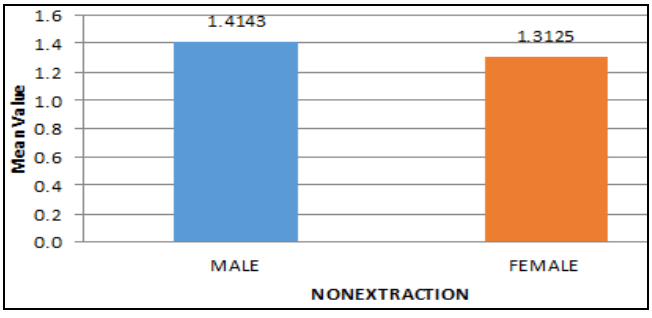
Graph 2: Significance of root resorption between gender



Graph 3: Significance of root resorption in extraction proclination group



Graph 4: Significance of root resorption in extraction crowding group



Graph 5: Significance of root resorption in non extraction group

Discussion

In our study we have compared root resorption before starting and after completion of treatment using panoramic radiograph by modified root resorption score as mentioned earlier in patients undergoing three different types of treatment modalities namely – extraction proclination extraction crowding and non extraction patients. Through our study we noticed the following

The table 1 in our study shows one way annova test where mean score, standard deviation and standard error of root resorption of 3 groups – extraction proclination, extraction crowding and non extraction is described. Here we can see that mean score of root resorption is highest in extraction proclination group (1.687) followed by extraction crowding (1.633) followed by non extraction group.

Table 2 shows annova analysis where significance in all the three group is calculated. It is visible from the table that values is statistically significant when all the three groups are being considered. To evaluate significance between inter group Post Hoc test is done in table 3. It shows that although root resorption is slightly greater in extraction proclination group when compared to extraction crowding group, it is statistically insignificant. Similarly when we compared extraction proclination group and extraction crowding group with non extraction group it shows positive significance indicating that amount and severity of root resorption is higher in extraction proclination group and extraction crowding group when compared to non extraction group. This indicates that patient undergoing extraction therapy is more likely to undergo root resorption apart from malocllusion it has when compared to non extraction therapy.

Table 4 and 5 shows the influence of gender with root resorption. Table 4 consist of males and females of all the three groups. It includes 31 males and 59 females. Independent sample t test is being carried out. It shows that gender is having no statistical significance with root resorption. In table 5 independent t test is being carried out to evaluate whether gender has significance within the groups. The result shows that there is no statistical significance of gender when each group is co related individually.

This shows that apart from the treatment being considered gender has no significance with root resorption. Ruo-ping Jiang36 in his study also concluded that extraction has some influence on treatment duration and root resorption. Extraction cases have a longer treatment duration and more severe root resorption than nonextraction cases. The influence of extraction on root resorption may be a consequence of treatment duration. Similarly our study also concludes that extraction therapy have positive significance with the amount of root resorption. Hence our study is in conjuction with the base study.

In our study we have also studied and compared the occurrence of root resorption due to two different types of malocclusion namely extractions due to proclination and crowding of teeth. It was found that there was slightly more resorption observed in patients who underwent extraction due to proclination of teeth. but when they were compared statistically it was found that there is no statistical significance between the two. Hence this concludes that root resorption is greater in extraction therapy regardless of the malocclusion of the patient at the start of the treatment.

Conclusion

The finding of this study suggest that

1. Comparing the proclination group with the crowding group it was found that the severity and amount of root

resorption was slightly greater in proclination group. However, no statistical significance was found between this two groups.

2. Comparing the extraction group with non extraction group it was found that root resorption in extraction group is significantly greater when compared with non extraction group.
3. When the two genders were compared it was found that the gender has no influence on the severity of root resorption.
    - The first null hypothesis states that there is no difference in root resorption between extraction and non extraction group. My study contradicts this null hypothesis as I have found that there is significant amount of root resorption observed in extraction group compared to non extraction group.
    - The second null hypothesis states that there is no difference in incidence of root resorption between males and females. My study is in conjunction with the second null hypothesis.
    - Hence we should always keep root resorption under consideration while planning extraction therapy and imply measures to minimize root resorption during the coarse of treatment.

Acknowledgments
The acknowledgments of this study I am very grateful to thank my departmental staff, my co-workers and my family.

Conflict of Interest
Not available

Financial Support
Not available

References

1. Brezniak N, Wasserstein A. Root resorption after orthodontic treatment: Part 1. Literature review. Am J Orthod Dentofacial Orthop. 1993 Jan;103(1):62-6. DOI:10.1016/0889-5406(93)70106-X. PMID: 8422033.
2. Andreasen JO. Cementum repair after apicoectomy in humans. Acta Odontol Scand. 1973;31:211-21.
3. Jiang RP, McDonald JP, Fu MK. Root resorption before and after orthodontic treatment: a clinical study of contributory factors. Eur J Orthod. 2010 Dec;32(6):693-7. DOI: 10.1093/ejo/cjp165. Epub 2010 Mar 22. PMID: 20308200.
4. Philips JR. Apical root resorption under orthodontic therapy Angle Orthod. 1955;25:1-22.
5. De Shields RW. A study of root resorption in treated class II Division I malocclusion. Angle Orthod. 1969;39:231-45.
6. Aminoshariae A, Aminoshariae A, Valiathan M, Kulild JC. Association of genetic polymorphism and external apical root resorption. The Angle Orthodontist. 2016 Nov;86(6):1042-9.

How to Cite This Article
Soni V, Mahadevia S. Root resorption occuring during different modalities of orthodontic treatment: A research based study. International Journal of Applied Dental Sciences. 2023;9(1):08-11.