**Evaluation of risk factors for severe apical root resorption in the maxillary incisors following fixed orthodontic treatment**

*Bashar shahrure, zeynep ahu acar*
*Marmara University, Faculty of Dentistry, Orthodontic Department*

## Abstract

**Aim:** The aim of this study is to retrospectively determine the incidence of severe external root resorption (grade 4 according to Malmgren et al.), in maxillary incisors, during fixed orthodontic treatment and to evaluate the possible predisposing factors for root resorption.

**Subject and Method:** The treatment records of 7000 patients who have been treated between years 1990 and 2019 were examined to determine potential predisposing factors of external root resorption, the following data was retrieved from the patients' records : age at the beginning of the treatment, gender, root morphology, overjet, overbite, treatment modality (extraction, non-extraction), treatment duration, buccal and palatal alveolar bone thickness in the maxillary incisors region, and amount of movement of the incisal root apices and incisal edges. Patients with missing records were excluded. Surgical, removable and unfinished cases were excluded, too. All subjects with severe root resorption (Grade 4) were identified and a matching group of control subjects with minimal root resorption (Grade 1) were selected for statistical comparisons. Root morphology was assessed on panoramic radiographs according to the classification proposed by Consolaro as follows: triangular, rhomboid, pipette and dilacerated. Overjet, overbite, buccal and palatal maxillary alveolar bone thickness, and amount of movement of the incisal root apices were assessed on cephalometric radiographs. The relationship between root resorption and the predisposing factors was assessed using chi square test.

**Result:** Severe apical root resorption was detected in 120 patients. The results have also demonstrated significant difference between the groups for the variables: increased overjet, treatment modality (extractions), increased treatment duration, cortical thickness of the alveolar bone, and amount of incisor movement at the end of the treatment. Conclusion: Extractions, intrusion, increased treatment duration, thin alveolar bone, and excessive incisor movement represent risk factors for severe root resorption in maxillary incisors following orthodontic treatment.

| Variables | | Control Group (n=90) | Resorption Group (n=90) | P-value |
|---|---|---|---|---|
| Gender | Male (n=84) | 40 (47.62%) | 44 (52.38%) | 0.55 |
| | Female (n=120) | 74 (61.67%) | 46 (38.33%) | |
| Type of Treatment | Without extraction (n=124) | 74 (59.66%) | 50 (40.32%) | <0.0001 |
| | With extraction (n=56) | 16 (28.57%) | 40 (71.43%) | |
| Root Morphology | Triangular (n=79) | 35 (44.3%) | 44 (55.7%) | 0.575 |
| | Rhomboid (n=69) | 38 (55%) | 31 (45%) | |
| | Pipette (n=16) | 9 (56.25%) | 7 (43.75%) | |
| | Dilacerated (n=16) | 8 (50%) | 8 (50%) | |

| | | Control Group (n=90) | | Resorption Group (n=90) | | |
|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | P-value |
| Initial age (years) | | 15.355 | 2.45 | 16.69 | 2.97 | 0.0012 |
| Treatment time (years) | | 2.29 | 0.936 | 5.5 | 3.66 | <0.0001 |
| | | Control Group (n=90) | | Resorption Group (n=90) | | |
| | | Mean | SD | Mean | SD | P-value |
| Overjet | | 4.39 | 2.24 | 4.61 | 2.93 | 0.572 |
| Overbite | | 2.19 | 2.01 | 1.93 | 3.17 | 0.512 |
| Bone Thickness | | 15.067 | 1.998 | 12.541 | 2.13 | < 0.0001 |
| Tooth Movement | | Control | | Resorption | | P- value |
| | | Mean | SD | Mean | SD | |
| Horizontal | Incisal Edge | 1.41 | 1.34 | 2.89 | 2.35 | < .0001 |
| | Root apex | 1.17 | 1.08 | 1.72 | 1.25 | 0.0018 |
| Vertical | Incisal Edge | 1.14 | 1.15 | 2.18 | 1.77 | < .0001 |
| | Root apex | 1.02 | 1.01 | 2.34 | 1.52 | < .0001 |

## Recent Publications

1. Consolaro A. Dental resorption in Clinical specialties. 2nd ed. Maringá, PR: Dental Press 2005.

2. Sameshima GT, Sinclair PM. Predicting and preventing root resorption: Part I.

Diagnostic factors. Am J Orthod Dentofacial Orthop 2001

3. Dudic A, Giannopoulou C, Leuzinger M, Kiliaridis S. Detection of apical root resorption after orthodontic treatment by using panoramic radiography and cone-beam computed tomography of super-high resolution. Am J Orthod Dentofacial Orthop 2009; 135(4): 434-7.

4. Picanço GV, de Freitas KMS, Cançado RH, Valarelli FP, Picanço PR, Feijão CP. Predisposing factors to severe external root resorption associated to orthodontic treatment. Dental Press J Orthod 2013; 18(1): 110-20.

5. Malmgren O, Goldson L, Hill C, Orwin A, Petrini L, Lundberg M. Root resorption after orthodontic treatment of traumatized teeth. Am J Orthod 1982; 82(6): 487-91.

**Biography**

Bashar Shahrure is an Orthodontic resident in Marmara University, his thesis was concerned with severe root resorption in a retrospective study following orthodontic treatment.

bashar.sh93@gmail.com