Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/gqm52h98

PREVALENCE OF ROOT RESORPTION IN ORTHODONTIC PATIENTS WITH PRE-EXISTING PERIAPICAL OR ODONTOGENIC PATHOLOGIES

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ABSTRACT

Background: One of the most typical complications of orthodontics is root resorption that is often underestimated. This risk can be increased when preexisting mouth diseases occur like a periapical lesion or odontogenic cyst. To identify the incidence of root resorption in the patient with orthodontic treatment and associate root resorption with pre-existing periapical or odontogenic lesions.

Methods: This prospective research study involved 71 patients who received a fixed orthodontic treatment in the Frontier Medical and Dental College, Abbottabad, between June 2023 and December 2023. Radiographic records were evaluated to identify the presence of any root resorption and the presence of pre-existing periapical or odontogenic pathologies. The severity of root resorption was graded and the statistical analysis was carried out by performing a chi-square test with a p-value being less than 0.05 taken to be significant.

Results: Root resorption was identified in 45.1% of patients. A significant association was observed between root resorption and both pre-existing periapical pathology ($p = 0.004$) and odontogenic lesions ($p = 0.028$). Maxillary incisors were the most frequently affected teeth. Treatment duration beyond 24 months also showed a strong correlation with increased resorption ($p = 0.013$).

Conclusion: Pre-existing periapical and odontogenic pathologies are significant risk factors for root resorption in orthodontic patients. Careful radiographic evaluation and individualized treatment planning are essential for minimizing complications in such cases.

Keywords: Root resorption, Orthodontic treatment, Periapical pathology, Odontogenic lesion, Radiographic evaluation, Tooth movement

INTRODUCTION

Orthodontic treatment is important in the correction of malocclusions as well as improvement of the function and esthetics. Nevertheless, as all dental procedures, it cannot be entirely harmless. Root resorption is particularly a process whereby the body has its remodeling process causing the shortening or even the degrading of dental roots; this can be regarded as one of the most clinically relevant adverse effects. Although mild cases of root resorption are always viewed as an inevitable consequence of the use of orthodontic forces, moderate to severe resorption cases could jeopardize tooth life and therapeutic results [1-3].

Root resorption has been associated with many factors which include magnitude and duration of applied forces, genetic pre disposition, and tooth anatomy among others. The hypotheses are, however, gaining support in a thriving body of evidence that generally indicates that known dental pathologic conditions like periapical inflammation or odontogenic cystic lesions are additional predisposing factors to resorptive changes of certain teeth. These pathologies can change the environment around the periradicular, meaning that the root surface is more vulnerable to harm in case it experiences orthodontic movement [4-6].

Despite the clinical relevance of this issue, the relationship between pre-existing dental pathologies and the development of root resorption during orthodontic treatment remains underexplored in local settings. This study was undertaken to evaluate the prevalence of root resorption among orthodontic patients and to investigate its possible association with pre-existing periapical or odontogenic lesions. The findings aim to support more informed diagnostic and treatment strategies for patients at risk of resorption.

METHODOLOGY

The proposed study was an observational, prospective study carried out in the Department of Orthodontics in the Frontier Medical and Dental College at Abbottabad during six months, starting June 2023 and December 2023. The aim of the study was to determine the severity and incidence of root resorption of patients during fixed orthodontic treatment, especially that of patients already having a periapical or odontogenic lesion.

The sample size contains 71 patients who have received a fixed approach of orthodontic treatment due to consecutive sampling of non-probability. They included patients aged 15 years to 35 years of age who had 100 per cent pre-treatment and follow-up radiographic records. Men and women were taken into consideration. They excluded patients with systemic conditions that influence disease of bone metabolism, a previous experience on orthodontic treatment, or patients with poor radiographic records.

Detailed demographic and clinical information was collected using a structured proforma. This included age, gender, malocclusion classification, duration of treatment, and type of appliance used. Pre-treatment panoramic radiographs (OPGs) and follow-up radiographs taken after the completion of active orthodontic therapy were reviewed for signs of root resorption and any underlying periapical or odontogenic pathology.

To minimize the observer bias, all the radiographic assessments were conducted by two calirmated examinators independently. Where disagreement was involved, a third senior orthodontist was consulted. Grade of the root resorption was assessed as the Levander and Malmgren index (Grade 0-no resorption; Grade 4-severe resorption). Pathologies found were periapical radiolucencies, cysts, or granulomas and this was identified through appearing as radiography and clinical history or past records to validate.

Prior to data collection, ethical approval was obtained from the Institutional Review Board of Frontier Medical and Dental College. All participants (or their legal guardians) provided informed written consent for the use of their clinical and radiographic records for research purposes. Confidentiality and anonymity of patient data were maintained throughout the study.

All collected data were compiled and analyzed using SPSS version 25.0. Descriptive statistics were used to summarize demographic and clinical characteristics. Chi-square tests were applied to

determine the association between root resorption and the presence of periapical or odontogenic pathology. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 71 orthodontic patients were included in the study. The majority were female (60.6%), while 39.4% were male. The mean age of participants was 24.1 ± 5.3 years. Most patients (70.4%) presented with Class I malocclusion, followed by Class II (21.1%) and Class III (8.5%).

Table 1: Demographic and Orthodontic Characteristics of Patients (n = 71)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	28	39.4%
Female	43	60.6%
Age (Mean ± SD)		24.1 ± 5.3
Type of Malocclusion		
Class I	50	70.4%
Class II	15	21.1%
Class III	6	8.5%

Root resorption was observed in 32 patients (45.1%). Pre-existing periapical pathologies were present in 23 patients (32.4%), while odontogenic cysts or related lesions were seen in 9 patients (12.7%). The prevalence of root resorption was significantly higher among patients with pre-existing periapical pathology ($p = 0.004$) and odontogenic lesions ($p = 0.028$).

Table 2: Association between Pathology and Root Resorption

Variable	Root Resorption Present (n=32)	Root Resorption Absent (n=39)	p-value
Pre-existing Periapical Pathology	17 (73.9%)	6 (26.1%)	0.004
Odontogenic Cyst/Lesion	6 (66.7%)	3 (33.3%)	0.028

Analysis of the severity of root resorption showed that the majority (62.5%) had mild resorption, followed by moderate (28.1%) and severe (9.4%). The most commonly affected teeth were the maxillary lateral incisors (40.6%), followed by central incisors (28.1%).

Table 3: Severity and Tooth Involvement in Root Resorption Cases (n = 32).

Variable	Frequency (n)	Percentage (%)
Severity of Resorption		
Mild	20	62.5%
Moderate	9	28.1%
Severe	3	9.4%
Affected Tooth		
Maxillary Lateral Incisors	13	40.6%
Maxillary Central Incisors	9	28.1%
Mandibular Incisors	6	18.8%
Premolars	4	12.5%

Further comparison of root resorption with orthodontic treatment duration and appliance type revealed that longer treatment durations (>24 months) had a significantly higher rate of resorption ($p = 0.013$). However, no significant association was found with the type of appliance used ($p = 0.447$).

Table 4: Association of Root Resorption with Treatment Variables

Variable	Root Resorption Present (n=32)	Root Resorption Absent (n=39)	p-value
Treatment Duration			
<12 months	6 (18.8%)	15 (38.5%)	
12–24 months	11 (34.4%)	18 (46.2%)	
>24 months	15 (46.9%)	6 (15.3%)	0.013
Type of Appliance			
Fixed Metal Brackets	25 (78.1%)	30 (76.9%)	
Ceramic Brackets	4 (12.5%)	5 (12.8%)	
Clear Aligners	3 (9.4%)	4 (10.3%)	0.447

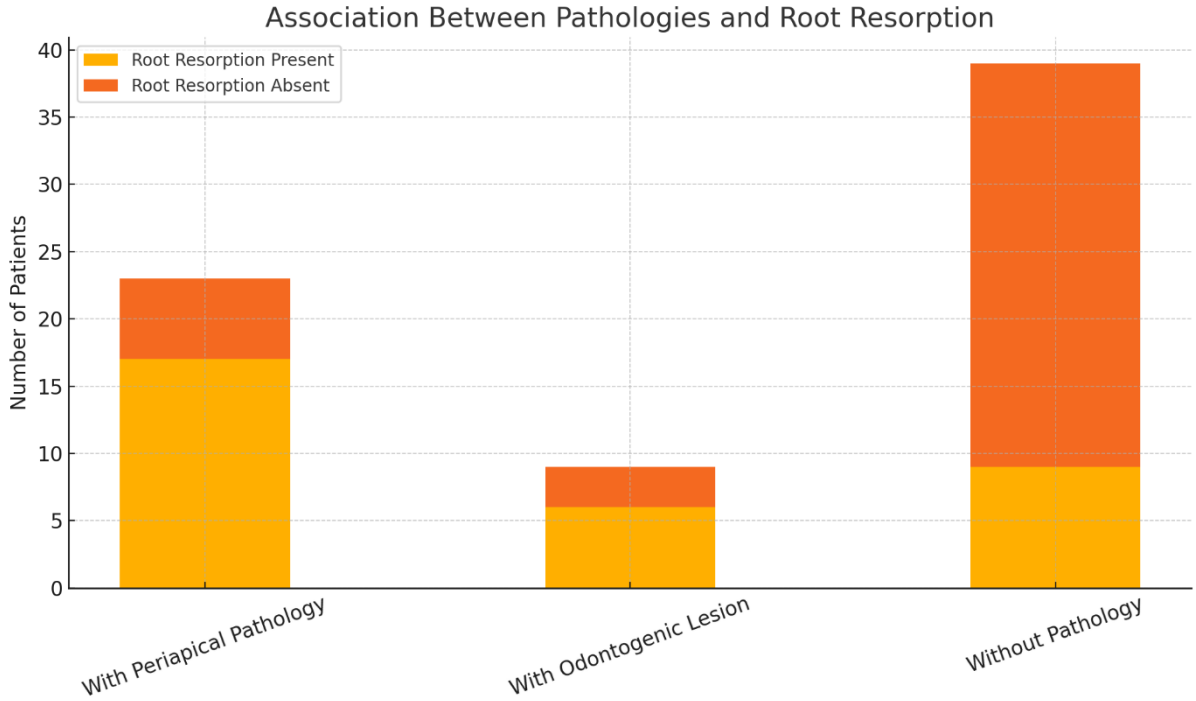

Figure 1: graph showing the association between pre-existing pathologies (periapical and odontogenic) and the presence or absence of root resorption in orthodontic patients.

DISCUSSION

Root resorption is a common, often unavoidable consequence of orthodontic tooth movement, but its severity and risk are influenced by various local and systemic factors. The present study aimed to assess how pre-existing periapical or odontogenic pathologies might contribute to the prevalence and extent of root resorption in orthodontic patients [7-9].

In this cohort of 71 patients, root resorption was identified in approximately 45% of cases. This frequency aligns with earlier findings reported in the literature, where resorption rates in orthodontic populations range between 30% and 50%, depending on diagnostic sensitivity and treatment variables. A significant association was found between root resorption and the presence of periapical pathologies ($p = 0.004$), indicating that teeth already compromised by inflammation or previous endodontic insult may be more vulnerable to additional damage during orthodontic force application. This was consistent with the studies emphasised that the biologic response of a tooth with a history of pathology is altered and less tolerant to stress [10-12].

Similarly, patients with odontogenic lesions such as radicular cysts or granulomas also showed a significantly higher incidence of root resorption ($p = 0.028$). These lesions may weaken periradicular support or disrupt the normal remodeling process, predisposing roots to apical

shortening. Comparable findings were documented by studies noted that periapical changes alter the resorption threshold under orthodontic loads [13-16].

Another important observation in this study was the greater frequency of resorption in patients with prolonged treatment durations (>24 months), supporting previous reports that duration is a contributing factor. In contrast, no significant link was found between appliance type and resorption, suggesting that biological conditions might outweigh mechanical ones in these cases.

Radiographically, maxillary lateral and central incisors were most commonly affected an expected pattern due to their thinner roots and prominent position in the arch. This pattern has been consistently reported in similar studies and reflects both anatomical vulnerability and the direction of applied force during retraction and levelling [17-20].

Overall, the findings emphasize the importance of thorough pre-treatment evaluation, especially in patients with prior periapical disease or radiolucent lesions. Endodontic status, history of trauma, and lesion stability should be considered before applying orthodontic forces, and close radiographic monitoring during treatment is essential in at-risk patients.

CONCLUSION

This study demonstrated a notable prevalence of root resorption among orthodontic patients, with a clear association between resorption and the presence of pre-existing periapical or odontogenic pathologies. Teeth with prior lesions appear more susceptible to restorative changes under orthodontic forces. These findings highlight the critical need for comprehensive diagnostic assessment and individualized treatment planning in orthodontics, especially for patients with a known history of periapical disease. Early identification and regular follow-up can help minimize adverse outcomes and preserve long-term dental health.

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