

## Prevalence Of Apical Root Resorption In Maxillary Incisors - A Retrospective Study

Research Article

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## Abstract

Apical root resorption is a common condition which is invariably detected by intraoral periapical radiographs. It is most commonly associated with periapical pathologies but is multifactorial in origin. The factors relevant to root resorption can be divided into biological and mechanical factors. Some mechanical and biological factors might be associated with an increased or decreased risk of root resorption during orthodontic treatment. For mechanical factors, the extensive tooth movement, root torque and intrusive forces, movement type, orthodontic force magnitude, duration and type of force are involved. For biological factors, a genetic susceptibility, systemic disease, gender and medication intake have been demonstrated to influence root resorption. The aim of this study was to evaluate the prevalence of apical root resorption in maxillary incisors. This study was conducted among the patients visiting the out patient department of a private dental college from June 2019 to March 2020. The data was formulated by reviewing the case sheets of the patients and the data was statistically analysed using Statistical Product and Service Solution software. Within the limits of the study, apical root resorption was more prevalent in the central incisors (40.82% - 11, 42.86%-21); It can be seen that apical root resorption was the highest in 11-20 years old for 11 (80.0%), 12 (57.1%) and 21 (57.1%). Chi-square analysis was done and there was no statistically significant association between the age and the prevalence of apical root resorption. (Pearson chi-square value: 8.758, df:9, p-value:0.460>0.05); It was most prevalent in 21 among males (45.0%) and in 11 among females (55.6%). Chi-square analysis was done and there was no statistically significant association between the age and the prevalence of apical root resorption. (p-value:0.772>0.05).

**Keywords:** Apical Root Resorption; Central Incisors; Incidence; Lateral Incisors; Maxillary Incisors.

## Introduction

The Glossary of the American Association of Endodontists defines resorption as a condition which is associated with either a physiologic or a pathologic process leading to loss of dentin, cementum or bone [25]. Physiologic resorption occurs in the primary teeth that results in their exfoliation. This process is followed by the eruption of their permanent successors [6, 28]. Pathologic resorption can be a sequence of orthodontic tooth movement, traumatic injuries, or chronic infections of the pulp or periodontal structures [25]. If this condition is untreated, it will result in the premature loss of the affected teeth [27].

Based on its location in relation to the root surface, root resorption can be classified into: Internal or external [28]. Internal resorption can be classified as internal replacement resorption and internal inflammatory resorption. External resorption is further classified into external inflammatory resorption, external surface resorption, external cervical resorption external replacement resorption, and transient apical breakdown [25, 28].

Idiopathic root resorption (external) is a condition that is infrequently reported and it has been observed either in multiple teeth or a single tooth. Pathological root resorption is associated with several systemic and local factors. The local factors enlisted are: Orthodontic therapy, trauma, periapical or periodontal inflamma-

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tion, occlusal stress, impacted and supernumerary teeth, tumors and cysts [42, 33]. The reported endocrine disturbances and systemic causes include: hypoparathyroidism, hyperparathyroidism, hypophosphatemia, hyperphosphatemia, Papillon-Lefèvre syndrome, Gaucher's disease, Goltz syndrome, Paget's disease, Turner syndrome, anachoresis as well as diet [22, 34].

The term "idiopathic" is used when an etiological factor cannot be identified. It can be well differentiated from the pathological variant and its advantages are recognized by a dental practitioner. The two types of idiopathic root resorption are cervical and apical. Cervical root resorption commences in the cervical portion of the tooth structure and advances towards the pulp chambers. In the apical variant the resorption commences apically and advances coronally. This movement results in shorter and rounder root structures [42, 44].

Patients with idiopathic root resorption present with no symptoms clinically but tooth mobility may often be observed occasionally. Therefore the condition is generally identified during radiographic examination [37, 40]. A review by Cholia et al states that, the idiopathic apical root resorptions were slightly more predominant in maxilla and in the posterior region when compared to the mandible and single root teeth; However, these results did not show statistical significance. Resorption was also more frequent in the male population between 14–39 years of age [2, 13].

Apical external root resorption which might be a consequence of a variety of causes may be present to a small extent in all permanent teeth [7, 9, 32]. However, at present literature shows only a few number of cases of idiopathic apical root resorption.

In our study we aimed to evaluate the prevalence of apical root resorption in maxillary incisors among the patients visiting a private dental college.

## Materials and Methods

### Study Setting

The present retrospective study was carried out in an institutional setting. The advantage of the study was the availability of a wide range of data. It was conducted to evaluate the number of apical root resorption cases among the population visiting a private dental college from June 2019 to March 2020. Ethical clearance for this study was obtained from the Institutional Ethical Committee with the ethical approval number being SDC/SIHEC/2020/DI-ASDATA/0619-0320. The population included in the study were 59 patients who were diagnosed to have apical root resorption at the Conservative dentistry and endodontics Department.

### Study design

This is a retrospective cross sectional study based on the set inclusion criteria of patients from the out patient department who were diagnosed with apical root resorption in maxillary incisors. Cases which did not fall under this inclusion criteria were excluded from the study.

### Sampling

The study was based on non probability convenience sampling.

To minimize the sampling bias, all the case sheets of patients with apical root resorption were reviewed and included.

### Data Collection and Tabulation

It was a retrospective study where the data was collected by reviewing the case records of the patients visiting the out patient department of a private dental college from June to March. The collected data included the following parameters: Patients details-Name, Age, Gender, Patient identification number and the presence of apical root resorption were recorded. A total of 86,000 case sheets and radiographs associated with the case sheets were reviewed and the data of the 59 patients with apical root resorption was further analysed. It was made sure that all the information needed for the study was retrieved from the case records with no duplicates with the help of a reviewer.

## Result And Discussion

This study shows that apical root resorption was more prevalent in the central incisors (40.82% - 11, 42.86%-21) when compared to the lateral incisors (14.29%- 12, 2.04%- 22). [Table 1][Figure 1] It can be seen that apical root resorption was the highest in 11-20 years old for 11 (80.0%),12 (57.1%) and 21 (57.1%) . Chi-square analysis was done and there was no statistically significant association between the age and the prevalence of apical root resorption. ( $p$ -value: $0.460 > 0.05$ ) [Table 1][Figure2]. It can be seen that apical root resorption is the most prevalent in 21 among males (45.0%) and in 11 among females (55.6%). Chi-square analysis was done and there was no statistically significant association between the age and the prevalence of apical root resorption ( $p$ -value: $0.772 > 0.05$ ) [Table 1][Figure 3].

External apical root resorption is often defined as shortening or blunting of the root apex. This condition is often associated with orthodontic treatment (Levander and Malmgren, 1988). According to the observations of our study, it can be seen that apical root resorption shows a male gender predilection (83.4%). Similar observations have been made by Glendor et al., [4] and Andersson et al. [1] A study by Plascencia et al., [30] shows that there was no gender predilection in apical root resorption and claims that the results could be due to the increase of participation of women in contact sports.

The current study shows that apical root resorption is more frequent among 9 year olds which is similar to the finding of Plascencia et al [30], Lam et al [14] and Andersson et al. [1] In our study we observed that apical root resorption is more common in central incisors, where 40.9% incidence is seen in 11 and 42.9% incidence is seen in 22 when compared to lateral incisors. This finding is similar to that of Mohandesan et al [23], Rosaline et al [39], Das AN [3]. The teeth that show more susceptibility to apical root resorption are the maxillary and mandibular incisors, especially the maxillary lateral incisors [18, 20, 41, 26, 36]. A few studies have reported a relationship between root resorption and narrow roots [20, 21, 45, 50, 10, 12]. Narrow root forms are more common in the maxillary lateral incisors than in the maxillary central incisors. A few studies state that maxillary lateral incisors experience resorption more frequently when compared to the other teeth during orthodontic treatment [20, 45, 19]. A study by Laux et al. correlated the clinical finding of root resorption with the histological examination [15]. In the study, resorption cases

Table 1. Table showing the association between gender,age and the prevalence of apical root resorption. Chi-square was performed and it can be seen that no statistically significant results were obtained.

Variable	Tooth number (%)				Total(%)	Statistical values		
	11	12	21	22		Pearson chi-value	df	p-value
Age								
11-20 years	50.00%	12.50%	37.50%	0.00%	100.00%	8.758	9	0.46
21-30 years	25.00%	16.70%	50.00%	8.30%	100.00%			
31-40 years	20.00%	20.00%	60.00%	0.00%	100.00%			
Gender								
Male	37.50%	15.00%	45.00%	2.50%	100.00%	1.123	3	0.772
Female	55.60%	11.10%	33.30%	0.00%	100.00%			

Figure 1. This frequency distribution chart shows prevalence of apical root resorption among different teeth. X axis is the tooth number and Y axis represents the percentage of teeth showing apical root resorption. Red colour in the graph represents 21 (Left central incisor) where resorption is present at 42.86%. Orange colour in the graph represents 11 (Right central incisor) where root resorption is present at 40.82%. Yellow colour in the graph represents 12 (Right lateral incisor) where root resorption is present at 14.29%. Green colour in the graph represents 22 (Left lateral incisors) where root resorption is present at 2.04%.

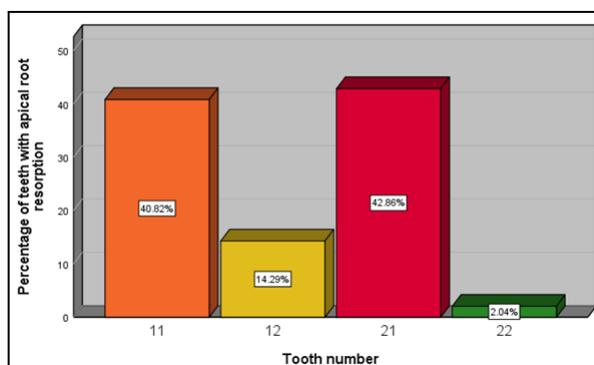
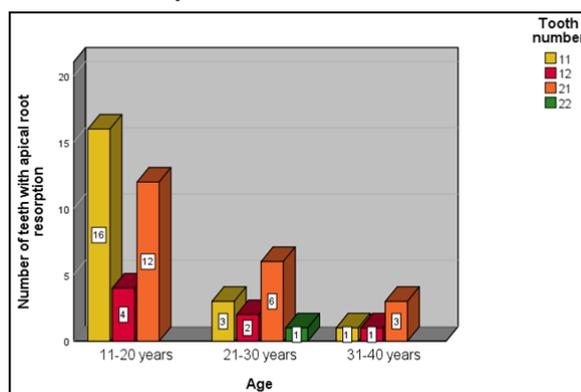


Figure 2. This bar chart shows prevalence of apical root resorption among different age groups. X axis is the age and Y axis represents the number of teeth with apical root resorption. Red colour in the graph represents 21; Orange colour in the graph represents 11; Yellow colour in the graph represents 12; Green colour in the graph represents 22. Chi-square analysis was done and there was no statistically significant association between the age and the prevalence of apical root resorption. (Pearson chi-square value: 8.758, df:9 , p-value:0.460>0.05 ) It can be seen that apical root resorption was the highest in 11-20 years old for 11,12 and 21.

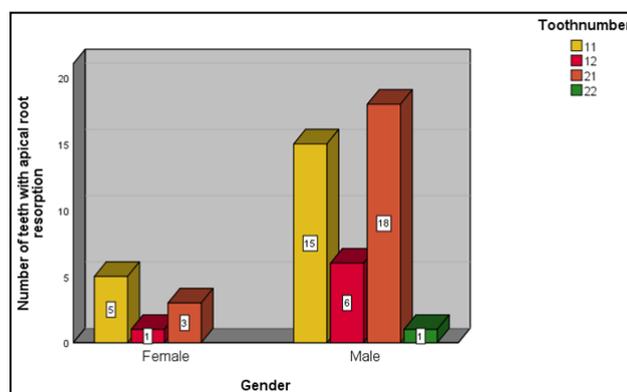


were identified more easily by histological examination (80% of cases) when compared to radiographic examination (18% of cases). Only the resorption cases that showed shortened roots were diagnosed reliably. External radicular resorption is often associated with periapical inflammation. The severity of resorption is proportional to the duration of the periapical inflammation. Histological studies reveal that the external resorption associated with cementum and dentin is a consequence of the activity of the granulation tissue in the area of resorption due to a chronic

inflammatory process [8, 46, 49]. It was concluded that periapical lesions such as granulomas and cysts and the apical external root resorption coexist with each other. These resorptions are usually not visible on the radiographs.

Several authors state that while managing more difficult cases of resorption, endodontic microscopes may be beneficial [29, 47, 24]. Root canal contamination and root fracture can be avoided by treating the open apex in a single sitting [38, 16, 5, 31, 44,

Figure 3. This bar chart shows prevalence of apical root resorption among the different genders. X axis is the gender and Y axis represents the number of teeth with apical root resorption. Red colour in the graph represents 21; Orange colour in the graph represents 11; Yellow colour in the graph represents 12 ; Green colour in the graph represents 22. Chi-square analysis was done and there was no statistically significant association between the age and the prevalence of apical root resorption. (Pearson chi-square value: 1.123, df:3, p-value:0.772>0.05) It can be seen that among males apical root resorption was the most prevalent in 21 and among females in 11.



48]. A study by Ravikumar et al. 2017 [11, 35] shows that dental practitioners lack [43] adequate knowledge regarding traumatic injuries in primary teeth, therefore future perspective would be to perform extensive research in this field to add to the knowledge of dental practitioners and to improve the overall quality of treatment provided. The vast majority of published papers regarding apical root resorption are mostly case reports or small sample studies.

Limitations for this study include geographic isolation and size of the population.

## Conclusion

Within the limits of the study, apical root resorption was more prevalent in the central incisors ; It can be seen that apical root resorption was the highest in 11-20 years old for 11,12 and 21. Apical root resorption was most prevalent in 21 among males and in 11 among females.

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## Author's Contribution

First author (Geethika.B) performed the analysis, and interpretation and wrote the manuscript. Second author (Dr. Adimalapu Hima Sandeep) contributed to conception, data design analysis, interpretation and critically revised the manuscript. Third author (Dr. Manjary Chaudhary) participated in the study and revised the manuscript. All the authors have discussed the results and contributed to the final manuscript.

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