

PREVALENCE OF ENDODONTICALLY TREATED POSTERIORES IN PATIENTS UNDERGOING ORTHODONTIC TREATMENT- CROSS-SECTIONAL RADIOGRAPHIC EVALUATION

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ABSTRACT

In this retrospective study, a total of 550 OPGs were assessed for Endodontically treated posterior teeth. The data obtained was obtained from an extensive electronic online database. A cross-verification was done with the clinical data for RC treated posterior in orthodontic patients. The prevalence of endodontically treated posteriors was 8.7% in the orthodontic population. Mandibular first molars accounted for nearly 46% of total root-canal treated posterior teeth, followed by maxillary first molar. A significant difference was found between males and females with and without RC treated posteriors. Males have more endodontically treated posteriors than females ($p>0.1$). A significant percentage of orthodontic patients have RC treated posteriors. Mandibular first molars are the most frequently endodontically treated posteriors treated posterior must be carefully assessed before orthodontic treatment as anchorage demands are high on these teeth. To obtain physiologic and successful treatment, altered treatment mechanics and treatment protocols have to be incorporated.

Key words: Endodontically treated teeth, RCT, Orthodontic patients, Prevalence, Posterior teeth.

Introduction

Root canal treatment and orthodontics have been linked for years. There have been constant debates and dimorphism about the success of root canal treatment. Literature suggests an increased risk of root resorption may be increased when orthodontic force is applied to the endodontically treated tooth or teeth [1-3].

There is no solid literature to report how orthodontic factors influence root resorption in endodontically treated teeth. Orthodontically induced external root resorption occurs in two forms: a) On the surface by loss of cementum. b) If this surface is the apical end of the root, it is manifested as the shortening of a tooth or blunting of the root [4, 5]. Various studies have reported various degrees of EARR in orthodontic patients ranging from 48-66% [4-6].

Root Resorption can be: A) Mild or Clinically Insignificant (less than 2mm); B) Severe or Clinically significant with more than 4mm of Root Resorption or more than one-third of root length resorbed. The latter frequently occurs during orthodontic treatment and has been reported in 14.5 % of incisors [7-9].

The etiology of External Apical Root Resorption has not been fully understood [10-12]. Multiple factors like- individual susceptibility, genetic predisposition [13], anatomical features, orthodontic treatment mechanics are few which can be held responsible for EARR [14]. The

extent to which these factors affect Root Resorption is unpredictable and controversial.

Posterior teeth, especially molars, are of utmost importance in orthodontic treatment. Posterior teeth such as molars and premolars teeth serve as a major anchorage unit [15].

Occlusal pits and fissures broad contact areas of molars and premolars make them susceptible to caries [16, 17]. Unless timely treated, extensive involvement of tooth structure may result, and to save the tooth, endodontic treatment becomes essential.

Anchorage consideration and endodontic treatment become important orthodontic considerations [3]. Even though polarities in view about orthodontics and endodontically treated teeth exist. However, the possibility exists that orthodontic forces lead to undue Root Resorption in endodontically treated teeth more than a contra-lateral vital tooth [2].

Very little is known about the frequency of endodontically treated posterior teeth, especially in the orthodontic population. This study was undertaken to assess the prevalence of root canal treated posterior teeth in orthodontic patients and focus on the orthodontic implications.

Materials and Methods

This retrospective study was conducted in the Department of Orthodontics, Saveetha Dental College, and Hospital.

Patient selection

Concerning all patients who had reported between June 2019 till March 2021 for orthodontic correction during the pre-treatment orthopantomograms, they were all eligible to be included in the analysis. Using the G*power software based on calculations from a previous study, the sample size of 550 was calculated [18]. The Permanent Maxillary and Mandibular - First Molars, Second Molars, First Premolar and Second Premolars were the teeth that were checked.

Inclusion and exclusion criteria

Inclusion Criteria was: (i) Patients above 12 years of age (marking the eruption of all permanent interiors in the upper and lower arch), (ii) Patients seeking orthodontic treatment.

Any subject was excluded if (i) Patient has H/O extraction of posterior teeth due to caries/ trauma/previous orthodontic treatment, (ii) Patient with congenitally missing molars and premolars

Data collection

The hospital's extensive online electronic database software was where the extraction of data was carried out from. They

obtained and tabulated the dental history and clinical status of each patient. From each patient's radiographic record, OPGs were individually downloaded.

Data assessment

Once the data collection was completed, each detail of the patient was tabulated, OPGs were assessed, and if any endodontically treated posterior tooth/teeth were present, a cross-evaluation was done by checking through the clinical data. Root canal treatment was evaluated from patients' dental history records. Once data collection was done, the data were analyzed using IBM SPSS Statistics Software-Version 23. Descriptive Analysis was used to report the prevalence of Endodontically Treated Posteriors in the Orthodontic Population. A Chi-square test was done to establish association amongst RC-treated posterior teeth and gender of the patient.

Results and Discussion

The orthodontic population's prevalence of endodontically treated posterior teeth was 8.7% (**Figure 1**).

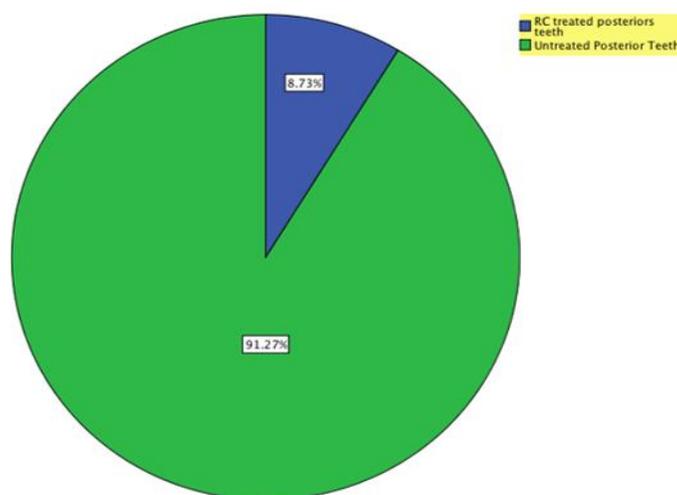


Figure 1. The pie-chart depicts the distribution of orthodontic patients with and without Root Canal Treated Posterior teeth. It represents 8.73 % of orthodontic patients had root canal treated posterior, and 91.27% of the population had no endodontically treated posterior.

In terms of individual prevalence highest was of Mandibular Permanent First Molars with 46.3%, followed by Maxillary Permanent First Molars with the prevalence of 29.6%. Mandibular Second Molars have a prevalence of 7.41% each. Maxillary first and second premolar, maxillary second molar and mandibular second premolars had prevalence of 3.7% each. The least affected posterior was Mandibular First Premolar, with a prevalence of 1.85% (**Figure 2**).

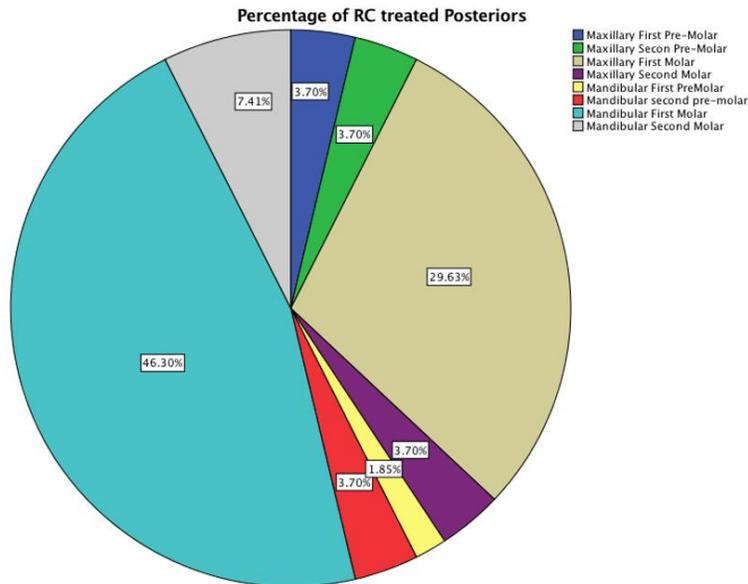


Figure 2. This Pie-Chart represents the percentage distribution of Root Canal Treated Posteriors in the Orthodontic Population. Light Blue denotes Mandibular First Molars with a maximum percentage of RC treated, i.e., 46.3%. Beige Colour denotes Maxillary First Molars with 29.63% of being RC treated. Gray color denotes Mandibular second molars, which are root canal treated in 7.41% of total cases. Maxillary First Premolars (Dark Blue), Maxillary Second Premolars (Green), Maxillary Second Molar (Purple), and Mandibular Second Premolars (Red) were endodontically treated in 3.7% of cases each. Mandibular first premolar(yellow) was least treated with 1.85% amongst total root canal treated posterior.

Males had a significantly higher number of Root Canal Treated posterior teeth than females ($p=0.06$, $p<0.1$) (**Figure 3**).

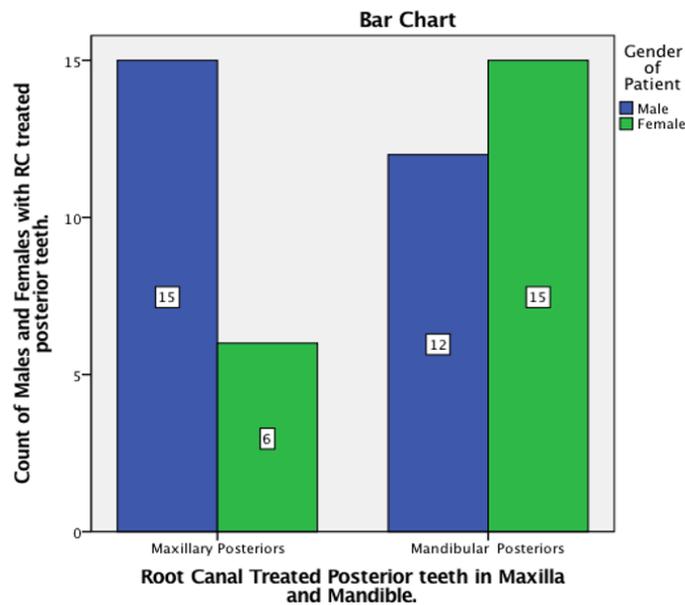


Figure 3. Bar Chart represents the association between RC-treated posterior amongst male and female orthodontic patients. The X-Axis represents Root Canal Treated posterior teeth in the maxilla and mandible, whereas the Y-axis represents the number of treated posterior in males and females. The green color denotes the females, and blue represents the male orthodontic patients. Males had a significantly higher number of root canal-treated posterior teeth than females. (Chi-Square Test; p-value=0.06, p-value >0.1 -Significant)

Results of the current study report a significant 8.7% prevalence rate of endodontically treated posteriors. Of 550 total OPG's assessed, 54 patients had root canal treated posterior, out of which many patients had more than one posterior endodontically treated.

In a study by Pegurier *et al.* [18], a prevalence rate of 18.9% of total root canal-filled teeth was found, higher than the current study. This can be because both anterior and posterior root canal treated teeth were included, and the study was conducted on a general population. They also reported a decreased percentage of males having RC-treated teeth than females. This is in contrast to the current study where males have a significantly higher number of Root Canal Treated posterior teeth. They reported that Maxillary First premolar had the highest percentage of RC treated, which is again not in line with the current study where the highest prevalence of RC treatment was found with Maxillary first molar.

A study by Gulsahi *et al.* [19] on the Turkish population reported a prevalence of root canal-filled teeth as 3.3% with a significantly higher number of females. This is in contrast to our results, where males have a significantly higher number of root canal treated posteriors.

In another previous study by Cleen *et al.* on the Dutch population, [20] the prevalence of root canal treated teeth (anterior and posterior) was 2.8% in the general population, lower than the current study results. This can be due to the difference in the sample population based on age. Also, the prevalence of only endodontically treated posteriors was assessed in our study. They also reported a higher prevalence rate of 11.3 % with Mandibular First Permanent Molars, which is in line with the current study results where a higher prevalence of RC treated mandibular molar was found.

In a similar study done on the Norwegian population by Eriksen *et al.* [21], a prevalence of 3.4% of endodontically treated teeth was found. A study on the Japanese population showed 87% of their subject had root canal treatment [22].

All the previous studies report prevalence rates ranging from 2.8-87%, with most of them having around 3%. Our study, conducted only on orthodontic patients, has reported a higher prevalence rate. All the previous studies reported from an endodontic perspective, orthodontic implications of such teeth haven't been reported in any previous studies. The current study is the first, which focuses on the prevalence of root canal-filled posterior teeth amongst the orthodontic population.

Molars are important as they bear heavy masticatory force, the demand for anchorage is higher on molars, and also, they are banded/bonded in most cases. The presence of crowns on molars and premolars also challenges basic orthodontic procedures, i.e., bonding/banding. Bonding becomes a non-viable option on the metal crown, and for the ceramic crown, a different etching agent is required (Hydrofluoric Acid). Occasionally crowns are bulkier, and to the band, these also become an issue because the pre-formed bands may not fit in; in such situations, customized bands are the only option that increases the chairside time.

Various orthodontic forces such as intrusion increase external apical root resorption risk [23, 24]. In terms of anchorage, a higher demand is put on molars as they retract interiors, especially in Type A anchorage cases. In Type B and C, the posteriors move 50-75% of the total distance to close the space. The risk of resorption increases with the greater distance moved.

The rate of tooth movement must be kept as physiologic as possible. Attempting to move teeth faster by applying heavy forces may lead to an increased rate of EARR in endodontically treated posteriors.

Before initiating orthodontic treatment, the quality of endodontic treatment must be carefully examined. A poorly done root canal treatment may increase the risk of resorption and recurrent infection [25]. This may lead to a halt in orthodontic treatment, further increasing the treatment time. Also, if the teeth become more infective, resorbed, or fracture in the course of events, the entire treatment plan has to be altered.

We, as an orthodontist, must ensure a treatment protocol with minimum disharmony to the teeth [26, 27]. Orthodontic tooth movement further must not degrade the condition of the endodontically treated teeth. Therefore more physiologic treatment mechanics must be involved in treating a patient with RC treated interiors. In most cases, the interiors are the ones to be retracted for a longer distance. A sequential treatment protocol must be followed to ensure appropriate bone and teeth remodeling [28]. Precaution to treat these patients orthodontically must be taken and must be informed [29].

Conclusion

- The prevalence of endodontically treated posterior teeth was 8.7%, with mandibular first molars accounting for a major percentage amongst all posteriors.
- Alternative anchorage methods must be considered to decrease further load demands on endodontically treated molars.
- As an orthodontist, a thorough evaluation of such teeth must be done before treatment. Knowledge about potential complications and treatment alternatives in such cases must be enhanced.
- An upgraded knowledge of the epidemiological data about root canal-filled posteriors in the orthodontic population will help incorporate more physiologic treatment plans and treatment mechanics.

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