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Prevalence of Root Canal Treated Anteriors in Patients Seeking Orthodontic Treatment

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Abstract

A definitive relationship exists between a root canal treated teeth and orthodontic tooth movement. Aim of this study was to assess the prevalence of root canal treated anteriors in the patients reporting for orthodontic treatment. Orthopantomogram of 550 patients were assessed for presence of any endodontically treated upper and lower anterior and was re-verified with the clinical data. Descriptive Statistics was used to to represent the data.Chi- Square test was done to evaluate the association of RC Treated anteriors between the genders.Prevalence of endodontically treated anterior teeth was found 0.4% was found in the current study. Highest prevalence was of maxillary central incisors ,secondary to trauma , in 96% cases. Maxillary Central Incisors are expected to be involved in trauma more frequently and therefore have higher incidence of root canal treatment. Multi-centre approach is needed before generalising the results to the entire population.

Key words:*Prevalence; Anterior Teeth; Endodontically treated teeth; Orthodontic Patients.*

Introduction

Root Canal Treatment and Orthodontics have been linked since years.There has been constant debates and dimorphism in opinion about success of Root Canal Treatment.Literature suggests there may be increased risk of root resorption when orthodontic force is applied to the endodontically treated tooth or teeth. [1–4]There is no solid literature to report as 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 apical end of root ,it is manifested as shortening of tooth or blunting of root.[5,6]Various studies have reported various degrees of EARR in orthodontic patients ranging from 48-66%.[5–7]

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 laters occurs frequently during orthodontic treatment and has been reported to occur in 14.5 % incisors.[8–10]Etiology of External Apical Root Resorption is not fully understood .[11–13]Multiple factors like- individual's susceptibility, genetic predisposition [14], anatomical features , orthodontic treatment mechanics are few which can be held responsible for EARR [9,15]. The extent to which these factors affect Root Resorption is unpredictable and controversial.Orthodontic treatment, Orthodontic Tooth Movement and Root Canal Treatment makes an essential triangle of concern . Reports have shown that endodontically treated tooth / teeth respond similarly to vital teeth to orthodontic force [6,16–18]. However, there exists another view that endodontically treated teeth are more susceptible to EARR.

The purpose of this study is to know the prevalence of endodontically filled anteriors in patients reporting for orthodontic treatment and to retrospectively assess cause of same, and ultimately update our data about present prevalence rate of RC-filled teeth and enhance our knowledge about employing necessary measures in our practice to minimize the effect of orthodontic treatment on EARR of such endodontically treated teeth.

Material and Method

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

Patient Selection:

The pretreatment orthopantomogramme of all patients who had reported to the department since June, 2019 till March,20202 for orthodontic correction were eligible to be included in the study.The sample size of 550 was calculated using G*power software,based on calculation from previous study . In each sample 12 anteriors were assessed which equals to 6000 anterior teeth in the entire sample population.The teeth assessed were: Permanent Maxillary and Mandibular : Central Incisors, Lateral Incisors and Canines i.e 12 teeth per individual were assessed .

Inclusion Criteria:

Patients seeking orthodontic treatment.

Age: Patients above 12 years of age (marking the eruption of all permanent anteriors in upper and lower arch)

Non-syndromic/Syndromic Patients : because the aim was to assess overall prevalence.

Exclusion Criteria:

Patients younger than 12 years.

Patients in which canines were yet to erupt/or impacted.

Data Collection:

The data collection from the electronic patient database.This database stores every information pertaining to history , general examination , required treatment , patient consent , treatment details and all radiographic records of nearly 86000 patients. This database was reviewed based on inclusion criteria and dental history and clinical status of each eligible patient was obtained and tabulated.OPGs were individually downloaded from each patient's radiographic record.

Data Assessment:

Once the data collection was completed, each detail of patient was tabulated, OPGs were assessed and if any endodontically treated was present, a cross evaluation was done by checking through clinical data.The reason for Root Canal Treatment was evaluated from Patients Dental History Record.All the data was tabulated.Once data collection was done, the results were obtained.Chi-Square test was done to see associations between RC treated anteriors and Gender.

Results and Discussion

Prevalence of endodontically treated is found to be 0.4 % .In total six - thousand anteriors analysed, 26 anteriors were RC treated (FIGURE:1) .In 26 RC treated anteriors , 18 were of Male and 6 belonged to female population.(GRAPH 1)

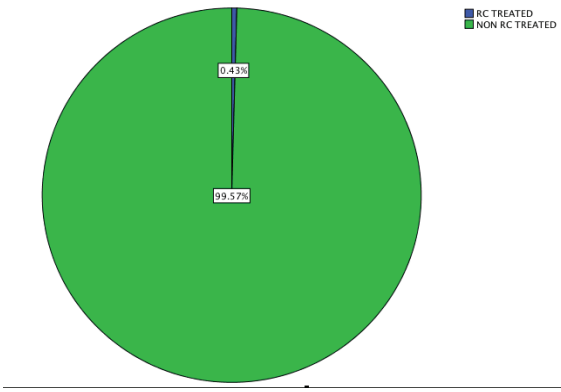

FIGURE 1: The Pie Chart showing frequency of RC treated anteriors in orthodontic population.Blue colour denotes patient who had Root Canal Treated Anterior teeth and Green color denotes the population without any Root Canal treated anteriors. A total of 0.43% (26-blue) Anterior Teeth Were Found To Be Rc Treated Of 6000 Anteriors Assessed.

Individual prevalence of Maxillary Central Incisor being endodontically treated was highest with 73% .15% of Mandibular central incisor accounts of total RC treated anteriors. Maxillary laterals and canines have an individual prevalence of 4% each of total RC treated anteriors. Least was Maxillary Canines with none being endodontically treated in all 550 OPGs assessed(FIGURE-2). Chi -Square test revealed that there was a statistically significant association of RC treated anteriors between males and females (p-0.011, p<0.05) (FIGURE -3)

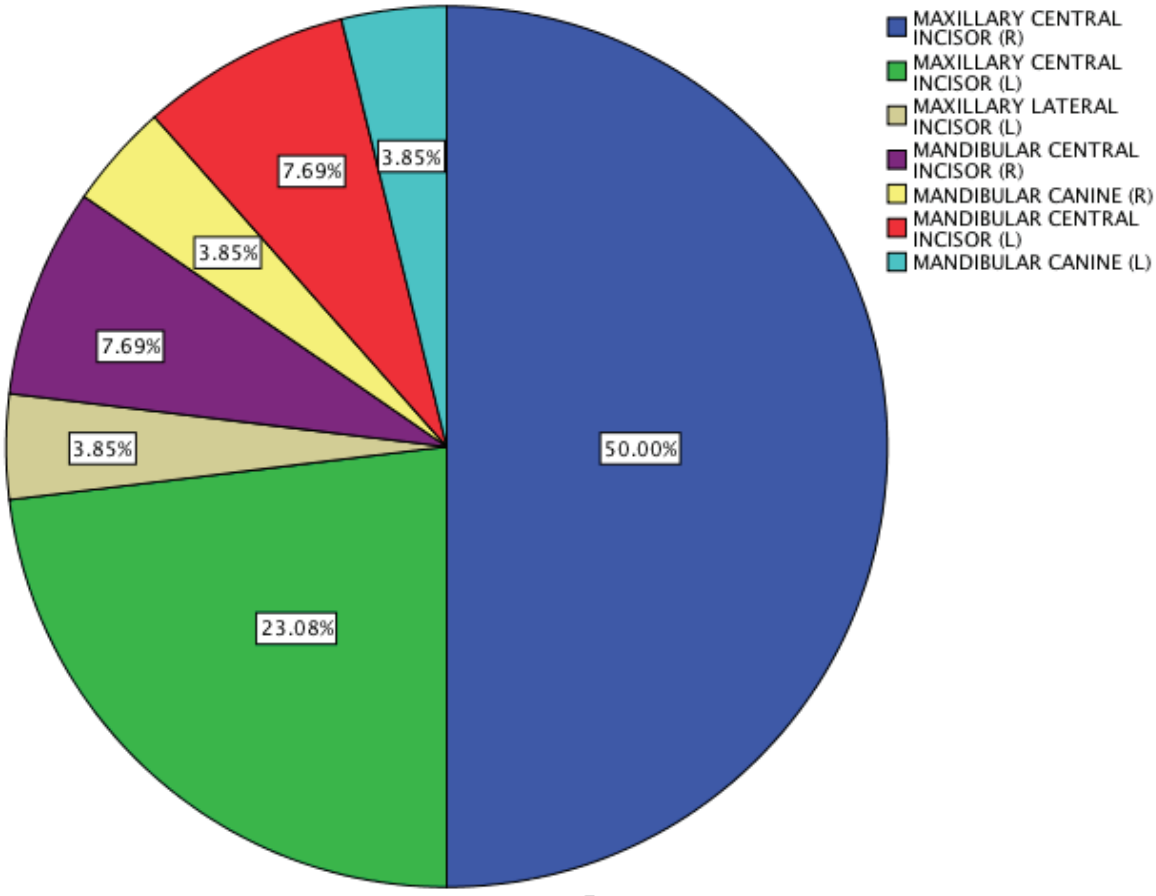

FIGURE 2:This Pie Chart represents the individual percentage of Endodontically treated Anteriors .Of all RC treated anteriors 50% were Right Maxillary Central incisors (Blue) and 23.1 % were Left Maxillary Central incisors(Green). Overall, 73.1% of RC treated anteriors were Maxillary Central Incisors. Mandibular Right Central incisor(Purple) and Mandibular Left Central incisor(Red) were endodontically treated 7.7% orthodontic patients respectively.Maxillary Lateral Incisor (Beige), Right Mandibular Canine (yellow)and left mandibular canine (blue) each contributed 3.8% of total Root Canal Treated Anteriors.

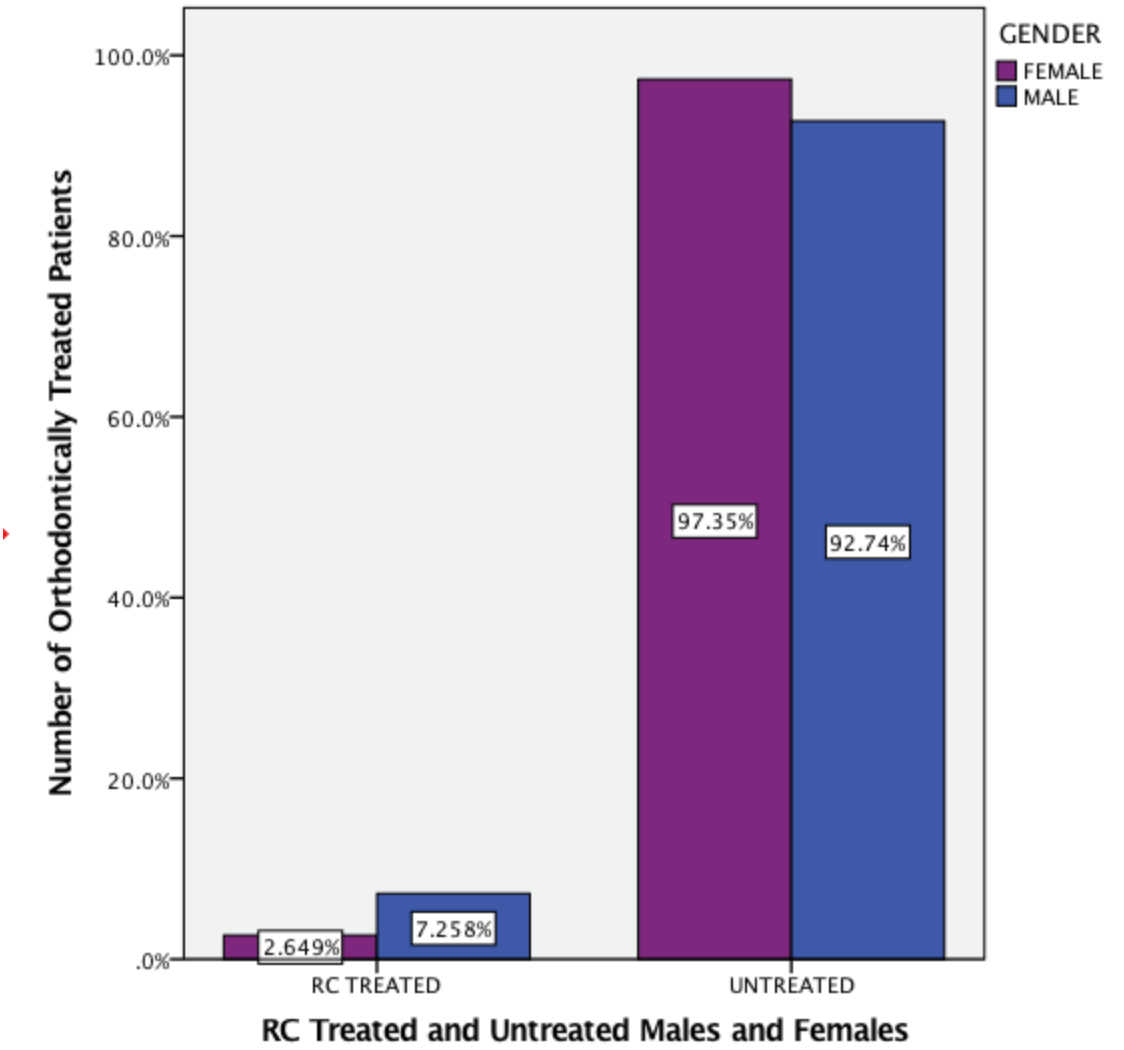

FIGURE 3: Bar Chart represents the association between RC treated anteriors amongst male and female orthodontic patients.X-Axis represents Root Canal Treated and Untreated Anteriors in Males and Females ,where as Y-axis represents the number of patients treated orthodontically. Purple colour denotes the females and blue represents the male orthodontic patients. Male orthodontic patients (7.25%-blue) have higher number of Root Canal Treated Anterior.This is statistically significant (Chi-Square Test;p-value- 0.01<0.05 statistically Significant)

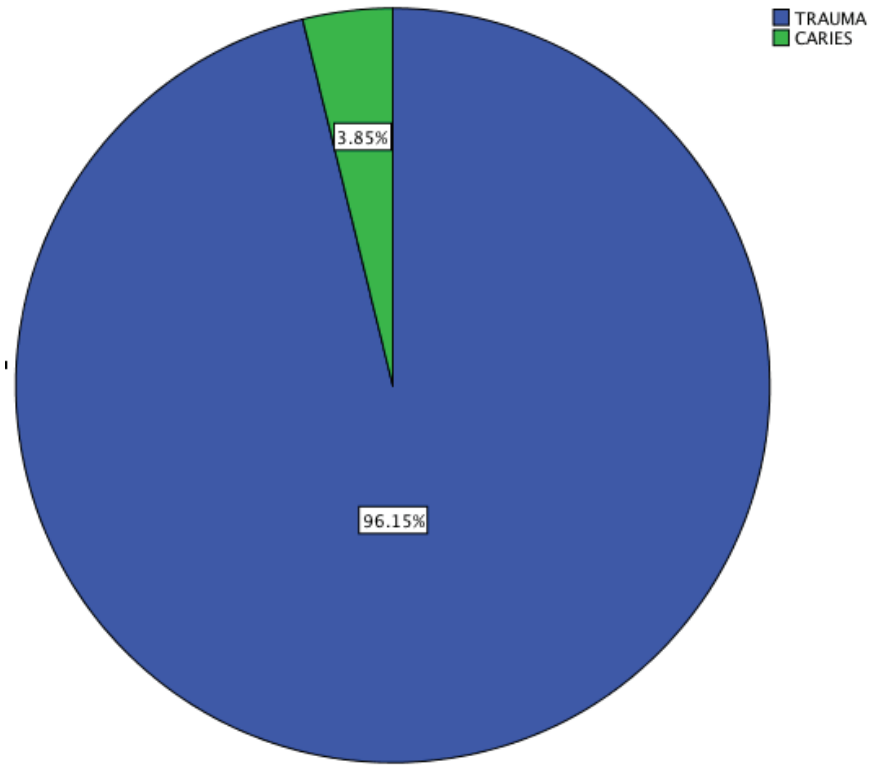

FIGURE 4: The Pie Chart Representing the distribution of the Cause Of Endodontic Treatment In Anteriors from the past Dental History Of Patient .Blue denotes teeth that have been treated endodontically secondary to trauma.Green represent anterior teeth which were endodontically treated due to caries. Majority of anteriors i.e 96.15% (blue) had experienced trauma and the remaining 3.85% underwent root canal treatment due to carious involvement.

In 96.2 % cases, the cause for undergoing root canal treatment was trauma to anterior tooth/teeth, remaining 3.8% were endodontically treated secondary to caries. (FIGURE- 4)

Data obtained from the current study suggests that a lesser percentage of anteriors are endodontically treated .However, even less percentage of anteriors being involved the risk of these endodontically treated anteriors getting affected by orthodontic tooth movement does not reduce.Maxillary Central Incisors accounts for more than two-third of total endodontically treated anteriors. The similar data has been suggested by previous studies that maxillary central incisors are more prone to trauma owing to proclination of these anteriors[19–21] .An angulation of more than average associated with variety of malocclusion is a common finding .A pool orthodontic patients reports with chief complaint of forwardly placed anteriors and in few instances also report history of trauma manifesting from a Elli's Class 1 fracture to avulsion .Thus it may be common to find maxillary central incisors being endodontically treated.

Mandibular central and lateral incisors are less likely to get trauma however they might be prone to caries due to poor oral hygiene and be involved pulpally .Maxillary and Mandibular Canines were rarely affected, except only with one patient where a proximal caries involved the mandibular canines , deep enough to undergo endodontic treatment.A previous epidemiological study by Cleen et al, carried out on Dutch population including 183 subjects reported a prevalence rate of 2.3%.With the increased sample size of the current study a prevalence of 0.4% can be considered significant.

Various orthodontic movements, exerts a variable degree of force on the tooth/teeth leading to variable degree of root resorption[22,23] .Orthodontic factors such as: (i)Type of tooth movement , (ii) Rate of tooth movement , (iii) extent of tooth movement,(iv) Anchorage demand on the teeth, (v)Type of appliance

used and (vi)Phase of orthodontic tooth movement may increase the risk root resorption, even more if the teeth are endodontically treated.[24–26]

Tooth Movement like Intrusion possesses an increased risk of apical root resorption , the force being concentrated at the root apex . Faster and farther the tooth is moved , risk for resorption tends to increase. Ameteur orthodontic mechanics may increase risk of root resorption .A larger percentage of orthodontic patients reports with a chief complaint of proclined anteriors and there exists previous literature supporting that trauma to anteriors is not very uncommon .Precaution to treat these patients orthodontically must be taken.We as an orthodontist must ensure a treatment protocol with minimum disharmony to the teeth [27]. Orthodontic tooth movement further must not degrade the condition of the endodontically treated teeth and therefore a more physiologic treatment mechanics must be involved in treating a patient with RC treated anteriors,as in most cases, the anteriors are the ones to be retracted for a longer distance.A sequential treatment protocol must be followed to ensure appropriate remodelling of the bone and the teeth. [28]

Previously our team had conducted numerous clinical trials [29–35] and lab animal studies [36–40] and in-vitro[41–43] studies over the past 5 years.Now we are focusing on epidemiological studies .The idea for this study stemmed from the current interest in our community. Patients, since the beginning must be informed about the status of the endodontically treated teeth and be updated about the same during the course of treatment.A patient consent pertaining to the status of endodontically treated teeth must be obtained before initiating the treatment.

Conclusion

Prevalence of endodontically treated teeth was found to be 0.4% , with maxillary central incisors accounting for major percentage amongst all anteriors.As an orthodontist a thorough evaluation of such teeth must be done before commencing the treatment. Knowledge about potential complications and treatment alternatives in such cases must be enhanced.

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Conflict of Interest: There is no conflict of interest

Source of Funding : Self

Ethical Clearance: Not Required

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