Original Article

Effect Of Orthodontic Treatment On Endodontically Treated Tooth: A Clinical Study

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Abstract

Background: To study the effect of orthodontic treatment on endodontically treated tooth.

Materials & methods: A total of 30 patients were enrolled. The subjects included had undergone root canal treatment in the past three months and were scheduled to undergo fixed orthodontic treatment. Intraoral examination of all the subjects was done. All the results were obtained and were analyzed by using SPSS software.

Results: Pulp stone formation was seen in 30% of the subjects while apical periodontitis was seen in 20% of the patients. Apical root resorption and enamel decalcification was seen in 13.4% of the subjects each.

Conclusion: Severe orthodontic force can lead to increasing pulp and peri-apical inflammation.

Keywords: orthodontic treatment, endodontically, resorption.

Introduction

Orthodontics comprise of tooth movement in the jaw from one position to another to attain esthetics. [1-3] It has always been interesting for clinicians to understand the basic concept of tooth movement, so that the treatment time could be reduced, resulting in patient satisfaction. [4] A lot of research has been done on the mechanical forces and tooth movement compared to the focus on cellular biology. [1] The principle of tooth movement in which applied pressure results in remodeling is a microscopic fact. [4] Although, there are lot of innovative mechanical devices for tooth movement but still we have not been totally successful in preventing periodontal injuries. This could be due to lack of complete cellular understanding. [1] The need to understand the specific remodeling pathways is essential to target those cells and achieve an impeccable prognosis. [5] The advantage of understanding the remodeling pathways helps us to design a better appliance which targets the specific cell for a controlled and safe accelerated tooth movement. [5,6]

Resorption of the tooth root is an unwanted phenomenon occurring in a significant proportion of the population. It is a complicated process and is irreversible. It involves cementum's external layers, radicular dentin/apex. It is often regarded as an undesirable adverse effect associated with orthodontic treatment. Significant data published

in the past literature have documented the number of cases highlighting orthodontic treatment associated with external tooth resorption. On force application, within the tissues, inflammatory process is initiated causing bone remodelling and root resorption. [7-9] Root resorption related to the fixed orthodontic treatment can occur because of several factors, like the type and magnitude of orthodontic forces and the duration of treatment. Orthodontic patients who have notable root resorption during the first 6 months of their active treatment are expected to experience resorption in later in the treatment. [10-11] Adjunctive orthodontic root extrusion and root separation are essential clinical procedures that will enhance the integrated treatment planning process of tooth retention in endodontic-orthodontic related cases. The need of orthodontic treatment in endodontically treated teeth is quiet a frequent requisite. However, the factors that forms the basis for clinical decisions and biological alignments normally applied is based on the collective data relevant to inflammation, tissue repair, tooth movement biology and accompanying resorptions, pulpal and periapical disease. [12-14] Hence, this study was conducted to study the effect of orthodontic treatment on endodontically treated tooth.

Materials & methods

A total of 30 patients were enrolled. The subjects included had undergone root canal treatment in the past three months and were scheduled to undergo fixed orthodontic treatment. Intraoral examination of all the subjects was done. Radiographic examination and treatment planning was done. Fixed orthodontic treatment was started. All the subjects were recalled. Endodontically treated tooth were assessed. All the results were obtained and were analyzed by using SPSS software.

Results

A total of 30 patients were enrolled. Mean age of the patients was 16.2 years. Out of 30 patients, 20 were males while the remaining 10 were females. Out of these 30 subjects, 20 were of urban areas while the remaining 10 were of rural areas. Pulp stone formation was seen in 30% of the subjects while apical periodontitis was seen in 20% of the patients. Apical root resorption and enamel decalcification was seen in 13.4% of the subjects each.

Table 1: Demographic data

Variable		Number of patients	Percentage of patients
Mean age (years)		16.2	
Gender	Males	20	66.7
	Females	10	33.3
Residence	Rural	10	33.3
	Urban	20	66.7

Table 2: Effect of orthodontic treatment on endodontically treated teeth

Effect	Number of patients	Percentage
Pulp stones	9	30
Apical periodontitis	6	20
Apical root resorption	4	13.4
Enamel decalcification	4	13.4

Discussion

An analysis of forces and vectors does not completely explain the mechanism of orthodontic tooth movement (OTM). The complex interaction of different strain, gene expressions and activation of signaling pathways sets a new paradigm for explaining the mechanism of orthodontic tooth movement. [15] The effect of medications on signaling molecules such as eicosanoids or prostanoids is important to regulate pathways and pathological responses, which directly or indirectly affects orthodontic biological tooth movement. [16]

Leukotrienes are the only eicosanoids that are formed independently from COX. Leukotrienes have an important role in inflammation and allergic diseases like asthma, however, based on an animal study done on rats, it also has some influence on OTM. The study demonstrated a significantly decrease in OTM after selective inhibition of leukotriene synthesis. [17] Therefore, these findings suggest that the drugs which inhibit leukotrienes indirectly decrease OTM. The medications such as Zafirlukast and Montelukast block the leukotriene receptor which has the same effect as inhibition of leukotriene synthesis. Another approach to inhibit leukotriene synthesis is by selective blocking of lipoxygenase enzyme which helps in conversion of arachidonic acid to leukotrienes. This is achieved by drugs such as Zileuton. So these drugs Zafirlukast, Montelukast and Zileuton which inhibit leukotrienes synthesis also decrease OTM. [16] Hence, this study was conducted to study the effect of orthodontic treatment on endodontically treated tooth.

In the present study, a total of 30 patients were enrolled. Mean age of the patients was 16.2 years. Out of 30 patients, 20 were males while the remaining 10 were females. Out of these 30 subjects, 20 were of urban areas while the remaining 10 were of rural areas. A study by Ali Alqerban et al evaluated the periapical status of endodontically treated teeth and the integrity of endodontic treatment before and after orthodontic treatment. This retrospective study was conducted by evaluating 128 teeth with root canal treatment (RCT). The teeth were obtained from 72 patients (23 males, 49 females) who had undergone fixed orthodontic treatment. Panoramic radiographs were taken and were evaluated before the start and after the completion of orthodontic treatment. Apical periodontitis (AP) was evaluated by the periapical index (PAI) and the probability index (PRI) of periapical bone destruction. Other variables related to the quality of root canal fillings were included, such as RCT quality index, length, and homogeneity, and coronal restoration. According to the PRI, the proportion of teeth with periapical bone destruction was significantly higher after orthodontic treatment. Overall, there was no significant change in the PAI scores after orthodontic treatment. However, the quality of the endodontic treatment moderated the change in the PAI score, as well as the change in the PRI. There was no significant increase in PAI and PRI scores after orthodontic treatment for adequately treated teeth. However, the risk for periapical lesions and bone destruction after orthodontic treatment was significantly increased for teeth receiving inadequate endodontic treatment compared with those receiving adequate endodontic treatment. Increased PAI and PRI after orthodontic treatment correlated with the quality of endodontic treatment. [18]

In the present study, pulp stone formation was seen in 30% of the subjects while apical periodontitis was seen in 20% of the patients. Apical root resorption and enamel decalcification was seen in 13.4% of the subjects each. Another study by Khan RA et al, conducted to evaluate root resorption in endodontically treated teeth following fixed orthodontic treatment. A total of 100 patients were enrolled. Only those patients were enrolled that were scheduled to undergo fixed orthodontic therapy. All the patients were recalled on follow-up, and radiographic examination was again carried out. Pretreatment radiographs and follow-up radiographs were compared. The incidence of root resorption was documented. Root resorption was present in 30 patients. Among these 30 patients, 20 were male, whereas 10 were female. In 19 patients, root resorption was present in the maxillary arch, whereas in 11 patients, it was seen in the mandibular arch. The most common tooth involved with root resorption was premolars, followed by anteriors and molars. The risk of root resorption is higher in endodontically treated teeth under the influence of orthodontic forces. [19] When the protective pre-dentin or pre-cementum gets removed or altered after an injury, it results in inflammation of the pulp or periodontium, which in turn induces root resorption with multinucleated clastic cells similar to those seen in bone resorption. [20] Despite the fact that this condition is mainly asymptomatic and frequently overlooked in diagnosis, it could lead to tooth mobility and even tooth loss if not diagnosed early and treated properly. [21] When 1-2 mm or one-fourth of the root length is lost, root resorption is considered clinically significant. However, permanent coronal mobility is only expected when the root is less than 9 mm in length. [22] Severe root resorption, when more than one-fourth of the root length or >5 mm resorb, occurs in 1%-5% of patients during orthodontic treatment. [23]

Conclusion

Severe orthodontic force can lead to increasing pulp and peri-apical inflammation.

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