

The Effect of Orthodontic Tooth Movement on Endodontically Treated Teeth

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ABSTRACT

Background: The success of orthodontic treatment is influenced by a number of factors, including periodontal health, oral hygiene, and orthodontic forces. There is often the need of moving teeth, which was endodontically treated or teeth still in endodontic treatment. The goal of orthodontic treatment is minimizing the biological damage and pain besides enabling an adequate teeth movement. Orthodontic movement of endodontically treated teeth was approached with suspicion for many years, and clinicians abstain from applying orthodontic movement to these teeth. Aim of the study: To study the effect of orthodontic tooth movement on endodontically treated teeth.

Materials and methods: The present study was conducted in the Department of Orthodontics of the Dental institution. In the present study, we included a total of 20 patients who were undergoing orthodontic treatment at the department. An informed written consent was obtained from the patients after explaining them the protocol of the study. After obtaining the consent, a total of 50 teeth which were selected for orthodontic movement, 25 vital and 25 endodontically treated teeth were selected in these patients. Regular radiographs were taken to study the movement of the teeth and the incidence of internal root resorption.

Results: In the present study, a total of 50 teeth, 25 vital and 25 endodontically treated teeth, in 20 patients were selected. The number of males was 11 and females was 9. The mean age was 23.69 years. We observed that the mean movement of vital teeth was 2.92 mm and endodontically treated teeth was 2.16 mm. The number of teeth with internal resorption was 3 in vital teeth and 9 in endodontically treated teeth.

Conclusion: Within the limitations of the present study, it can be concluded that the incidence of root resorption is significantly evident in endodontically treated teeth when subjected to orthodontic treatment.

Keywords: Orthodontic treatment, vital teeth, non-vital teeth, endodontically treated teeth.

INTRODUCTION

The success of orthodontic treatment is influenced by a number of factors, including periodontal health, oral hygiene, and orthodontic forces. ¹ Tooth movement induced by orthodontic force application is characterised by remodelling changes in the

dental and periodontal tissues. ² Two interrelated processes involved in OTM are (1) deflection, or bending, of the alveolar bone and (2) remodelling of the periodontal tissues, including the dental pulp, periodontal ligament (PDL), alveolar bone, and

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gingiva. The applied force causes the compression of the alveolar bone and the PDL on one side, while on the opposite side the PDL is stretched.³ There is often the need of moving teeth, which was endodontically treated or teeth still in endodontic treatment. The goal of orthodontic treatment is minimizing the biological damage and pain besides enabling an adequate teeth movement. Orthodontic movement of endodontically treated teeth was approached with suspicion for many years, and clinicians abstain from applying orthodontic movement to these teeth. However, there are close relations between all professional fields of dentistry; the relation between endodontics-orthodontics has attracted the attention of researchers less frequently, and there have not been any definitive judgments on the subject. This makes planning and follow-up of the treatment difficult for clinicians and causes problems in terms of complications that may occur during the treatment and approaches to the complications. It was stated that teeth which had endodontic treatment can be moved as easy as teeth with vital pulp.^{4,5} It does not affect orthodontic movement unless ankylosis develops. There are publications which state that root canal must be cleaned, shaped and filled with CH, restored occlusally in order to prevent bacterial leakage, and canal must be filled after orthodontic tooth movement is completed if there is a need for endodontic treatment during orthodontic movement.⁶ Hence, the present study was conducted to study the effect of orthodontic tooth movement on endodontically treated teeth.

MATERIALS AND METHODS

The present study was conducted in the Department of Orthodontics of the Dental institution. The ethical clearance for the study was approved from the ethical committee of the hospital. In the present study, we included a total of 20 patients who were undergoing orthodontic treatment at the department. An informed written consent was obtained from the patients after explaining them the protocol of the study. After obtaining the consent, a total of 50 teeth which were selected for orthodontic movement, 25 vital and 25 endodontically treated teeth were selected in these patients. Regular radiographs were taken to study the movement of the teeth and the incidence of internal root resorption.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistically significant.

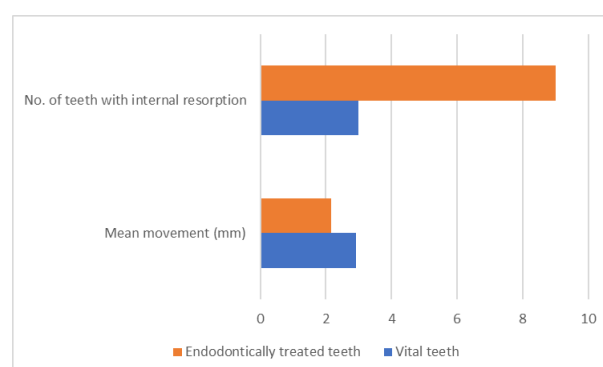
Table 1: Demographics data.

Variables	Values
Total no. of patients	20
Male/Female	11/9
No. of vital teeth	25
No. of endodontically treated teeth	25
Mean age (years)	23.69

Table 2: Comparison of vital and endodontically treated teeth after orthodontic movement.

	Vital teeth	Endodontically treated teeth	p-value
Mean movement (mm)	2.92	2.16	0.28
No. of teeth with internal resorption	3	9	0.002

Fig 1: Vital and endodontically treated teeth after orthodontic movement.



RESULTS

In the present study, a total of 50 teeth, 25 vital and 25 endodontically treated teeth, in 20 patients were selected. Table 1 shows the demographic data of the participants. The number of males was 11 and females was 9. The mean age was 23.69 years. Table 2 shows the comparison of vital and endodontically treated teeth after orthodontic movement. We observed that the mean movement of vital teeth

was 2.92 mm and endodontically treated teeth was 2.16 mm. The number of teeth with internal resorption was 3 in vital teeth and 9 in endodontically treated teeth. The results on comparison were found to be statistically significant for internal resorption. ($p < 0.05$) [Fig 1]

DISCUSSION

In the present study, we observed that the endodontically treated teeth when subjected to orthodontic treatment results in more rate of internal resorption as compared to vital teeth. The mean movement with orthodontic treatment was statistically non-significant in vital teeth and endodontically treated teeth. The results of present study were compared with previous studies from the literature. Esteves T et al ⁷ evaluated whether there is similarity in the apical root resorption found in endodontically treated teeth and untreated teeth when they are submitted to orthodontic treatment. From 2,500 treatment records examined, 16 patients were selected who had a maxillary central incisor treated endodontically before initiation of the orthodontic movement, and a vital homologous tooth (for control). Measurements were made by comparing the periapical radiographs taken before and after the orthodontic treatment. There was no statistically significant difference in apical root resorption found in the endodontically treated teeth compared to the group of vital teeth. Tanaka OM et al ⁸ analyzed the effect of orthodontic movement on non-vital teeth, illustrated with a clinical case. Induced resorption during tooth movement depends on multiple factors, which require the close attention of the dentist to ensure an accurate diagnosis and correct mechanotherapy with respect to the periodontium. The orthodontic treatment described in their was performed on a woman 36 years of age with endodontically treated teeth. This case demonstrated that the biomechanics follow biological principles and thus prevent deleterious effects on the components of the periodontium and the bone and maintains the integrity of the root length.

Spurrier SW et al ⁹ determined whether vital and endodontically treated incisors exhibit a similar severity of apical root resorption in response to orthodontic treatment. Forty-three patients who had one or more endodontically treated incisors

before orthodontic treatment and who exhibited signs of apical root resorption after treatment were studied. In each patient the vital contralateral incisor served as a control. Vital incisors resorbed to a significantly greater degree than endodontically treated incisors (p less than or equal to 0.05). When patients were separated by gender, control teeth in males exhibited a statistically significant increase in resorption over control teeth in females. No significant differences were apparent between males and females when endodontically treated incisors were compared. Satoh I et al ¹⁰ studied the effect by the pulpectomy accompanied with tooth movement on the process of root resorption and regeneration of periodontium. A hundred and fifty Wistar rats, weight 180-200 g, 6 weeks old, were used as experimental animals. Prior to experimental tooth movement, first molars of 50 rats were received pulpectomy on both sides followed by filling of root canal (first group) and those of another 50 rats on single side (second group). Maxillary first molars of the other 50 rats were saved as a vital dental pulp control (third group). The first and the third groups of animals were then subjected to experimental tooth movement with the interproximal insertion of elastic rubber as described by Waldo (1953) for 3 days, 1, 2, 3 and 4 weeks. After tooth movement was terminated, animals were sacrificed by ether inhalation or by perfusion of glutaraldehyde fixation solution. The upper jaw from each rat was dissected and prepared specimens for non-decalcified section and light microscopic section. Root resorption and regeneration of cementum were evaluated quantitatively using the modular system for semiautomatic quantitative evaluation of images on the light microscopic section. Occurrence of external root resorption with multinucleated odontoclast associated with experimental tooth movement in pulpectomized tooth were lesser and later than those of vital teeth. These findings suggest that the dental pulp plays an important role in the processes of root resorption and remodeling of cementum associated with orthodontic tooth movement.

CONCLUSION

Within the limitations of the present study, it can be concluded that the incidence of root resorption is significantly evident in endodontically treated teeth when subjected to orthodontic treatment.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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