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ORIGINAL RESEARCH

Analysis of impact of fixed orthodontic treatment on dental pulp

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ABSTRACT:
Background: The present study was undertaken for assessing the effect of orthodontic treatment on dental pulp. **Materials & methods:** A total of 100 patients who underwent orthodontic treatment during the study period were included in the present study. Complete demographic details of all the patients were obtained. Radiographs were taken during the pre-treatment phase and findings were recorded in separate Performa. Mean volume of pulp tissue was assessed both during pre-treatment and post-treatment phase and were evaluated. **Results:** Significant results were obtained while comparing the incidence pre-treatment and post-treatment pulp stones. In the present study, mean pre-treatment pulp volume of incisors was found to be 42.3 mm3 while mean post-treatment pulp volume of incisors was found to be 38.1 mm3 respectively. Mean pre-treatment pulp volume of canines was found to be 54.6 mm3 while mean post-treatment pulp volume of canines was found to be 50.2 mm3 respectively. While comparing the pre-treatment and post-treatment pulp volumes among incisors and canines, significant results were obtained. **Conclusion:** Dental pulp tissue is affected significantly under the effect of orthodontic forces.
Key words: Orthodontic treatment, Dental pulp.

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INTRODUCTION

The orthodontic dental movement has an inflammatory-like effect on pulp tissue, initially causing changes in blood flow, increasing the level of angiogenic growth factors, central and peripheral angiogenesis and generating changes in the odontoblastic layer. Early biochemical changes include a reduction in the activity of alkaline phosphatase and increased activity of aspartate aminotransferase.[1-3] At the neuronal level, the expression of substance P (SP) in response to orthodontic movement in pulp has been described as well as its potent action in neurogenic inflammation which is directly related to the pain sensation during orthodontic treatment. Histological examination is neither practical nor feasible in clinical situation.[4-6] Therefore, application of pulp testing methods is suggested to provide additional diagnostic information. Different pulp tests have been proposed and examined aiming at assisting the diagnosis and treatment planning for the clinician.[5-7] Hence; under the light of above mentioned data, the present study was undertaken for assessing the effect of orthodontic treatment on dental pulp.

MATERIALS & METHODS

The present study was conducted with the aim of assessing the effect of orthodontic treatment on dental pulp. A total of 100 patients who underwent orthodontic treatment during the study period were included in the present study. Complete demographic details of all the patients were obtained. Radiographs were taken during the pre-treatment phase and findings were recorded in separate Performa. Radiographic investigations was done both during pre-treatment phase and post-treatment phase. Prevalence of pre-treatment and post-treatment pulp stones was assessed using the radiological findings. Also, on doing radiographic analysis, mean volume of pulp tissue was assessed both during pre-treatment and post-treatment phase and were evaluated. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi- square test was used for assessment of level of significance.

RESULTS

In the present study, a total of 100 patients undergoing orthodontic treatment were analyzed. Mean age of the patients was found to be 18.2 years. There were 56 males and 44 females in the present study. Majority of the patients belonged to the age group of less than 20 years. Incidence of pulp stones during the pre-treatment and post-treatment phase was found to be 26 percent and 41 percent respectively. Significant results were obtained while comparing the incidence pre-treatment and post-treatment pulp stones. In the present study, mean pre-treatment pulp volume of incisors was found to be 42.3 mm^3 while mean post-treatment pulp volume of incisors was found to be 38.1 mm^3 respectively. Mean pre-treatment pulp volume of canines was found to be 54.6 mm^3 while mean post-treatment pulp volume of canines was found to be 50.2 mm^3 respectively. While comparing the pre-treatment and post-treatment pulp volumes among incisors and canines, significant results were obtained.

Table 1: Incidence of pre-treatment and post-treatment pulp stones

Pulp stones	Pre-treatment	Post-treatment
Number of patients	26	41
Percentage	26	41
p- value	0.00 (Significant)	

Table 2: Mean pulp volume pre-treatment and post-treatment

Tooth	Mean pre-treatment pulp volume (mm^3)	Mean post-treatment pulp volume (mm^3)	p- value
Incisors	42.3	38.1	0.00 (Sig.)
Canine	54.6	50.2	0.00 (Sig.)

DISCUSSION

Orthodontic treatment is a discipline in dentistry, like many other disciplines in this field, it can have adverse effects associated with the execution of treatment. These effects can be related to the patient or practitioner. Some of these effects are not fully understood, such as root resorption, and others are associated with orthodontic treatment without supporting evidence. Consideration of risk factors prior to treatment is important. Only risk factors that have been supported by previous evidence will be reviewed in this article. These adverse effects include root resorption, pain, pulpal changes, periodontal disease, decalcification, and temporomandibular dysfunction.[7- 9] Hence; under the light of above mentioned data, the present study was undertaken for assessing the effect of orthodontic treatment on dental pulp.

In the present study, a total of 50 patients undergoing orthodontic treatment were analyzed. Mean age of the patients was found to be 18.2 years. There were 56 males and 44 females in the present study. Majority of the patients belonged to the age group of less than 20 years. Incidence of pulp stones during the pre-treatment and post-treatment phase was found to be 26 percent and 41 percent respectively. Significant results were obtained while comparing the incidence pre-treatment and post-treatment pulp stones. Elham S J Abu Alhaija et al compared the initial changes of pulpal blood flow (PBF) using clear aligner and fixed orthodontic treatment. A total of 45 subjects were subdivided into 2 groups: group 1; 25 subjects treated with preadjusted edgewise fixed appliance with 0.014″ nickel titanium as the alignment archwire and group 2; 20 subjects treated using clear aligner. In both groups, PBF was measured for the maxillary right and mandibular left teeth using Laser Doppler flowmetry at different time intervals (20 minutes, 48 hours, 72 hours, and 1 month) after the fitting of the nickel titanium archwire in group 1 and after the delivery of the second aligner in group 2. A repeated-measures analysis of variance and a Bonferroni post-hoc comparison test were applied to determine differences at the various time intervals. The PBF decreased in both types of appliances after force application. The maximum reduction in PBF was reached after 72 hours. It returned to its normal values within 1 month. The differences in PBF between the 2 groups did not reach any statistical significance. PBF in orthodontically treated teeth decreased 20 minutes after orthodontic force application in both fixed and clear aligner appliances. In both treatment groups, most changes occurred within 48 hours of force application. PBF returned to its normal values within 1 month. Changes in PBF in both treatment groups were comparable.[10]

In the present study, mean pre-treatment pulp volume of incisors was found to be 42.3 mm^3 while mean post-treatment pulp volume of incisors was found to be 38.1 mm^3 respectively. Mean pre-treatment pulp volume of canines was found to be 54.6 mm^3 while mean post-treatment pulp volume of canines was found to be 50.2 mm^3 respectively. While comparing the pre-treatment and post-treatment pulp volumes among incisors and canines, significant results were obtained. Lee Y et al compared the degree of EARR of root-filled teeth with that of contralateral teeth with vital pulp after fixed orthodontic treatment. The study sample consisted of 35 patients aged 25.23 ± 4.92 years who had at least 1 root-filled tooth before orthodontic treatment. Digital panoramic radiographs of each patient taken before and after orthodontic treatment were used to measure the EARR. The Student t test for matched pairs and the Pearson correlation analysis were applied. The mean EARR values were 0.22 (0.14, 0.35) for root-filled teeth and 0.87 (0.59, 1.31) for contralateral teeth with vital pulp, indicating significantly less EARR for root-filled teeth

compared with the contralateral teeth with vital pulp after orthodontic treatment. EARR was influenced by the patient's age, treatment duration, treatment type, and periapical pathosis, but not by tooth type and sex. Root-filled teeth appear to be associated with significantly less EARR than are contralateral teeth with vital pulp.[11]

CONCLUSION

From the above results, the authors concluded that the dental pulp tissue is affected significantly under the effect of orthodontic forces. However; further studies are recommended.

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