

Original Research

Effect of orthodontic treatment on dental pulp

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ABSTRACT:

Background: To evaluate the effect of orthodontic treatment on dental pulp. **Materials & methods:** A total of 20 subjects were enrolled with age ranging from 15 to 25 years. Maxillary and mandibular first and second premolar and molar teeth were selected for the purpose of the study. A total of 320 teeth of 20 subjects were studied. Required data was collected and analyzed by using SPSS software and chi-square test was done to find significant values with $p \leq 0.05$ and considered as a significant value. **Results:** 1 out of 8(12.5%) male subjects were diagnosed with pulp stones before the orthodontic treatment and after completion of orthodontic treatment 2 out of 18 (25%) were found to have pulp stones. Among 20 cases, 3 (15%) cases reported pulp stones before the commencement of the orthodontic treatment and 5 in total (25%) cases after the completion of orthodontic treatment. Pulp stones were found in the age group 20 to 25 years. **Conclusion:** The study showed the presence of pulp stones more in maxillary first molar before and after orthodontic treatment.

Keywords: orthodontic force, pulp, calcification.

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INTRODUCTION

The orthodontic tooth movement (OTM) could be defined as the results of tooth biological system response to the application of an externally force; all the biological responses that take place after force application lead to bone remodeling that is necessary for OTM. ^{1,2}The size of the biological response depends on the application time, force magnitude and force distribution in fact, different force distribution patterns could determine different type of tissue reactions. ³ In fact, different force distribution patterns could determine different type of tissue reactions. By that, several studies focused on evaluating tissue reaction to force appliance, and iatrogenic sequelae to orthodontic force have been detected. ^{4,5}Pulp stones are foci of calcification in the pulp of tooth. Calcification can occur in the dental pulp as discrete calcified stones or as diffuse form that can occur freely in the pulp tissue or is attached to or embedded into dentin. ⁶ Depending on their microscopic

structures, pulp stones have been classified into true or false form. They are not clinically apparent but are common radiographic findings. ⁷

They have variable radiographic appearance; they may be radiopaque structure within the pulp chamber or in the root. They do not have uniform shape or number. They may be round or oval, and some pulp stones inhabit most of the pulp chamber. Some may be large as 2 or 3 mm in diameter. Only these large calcified concretions are radiographically discernible. Pulp stones occur most commonly in molars, although they occur in all tooth types. ⁸ Healthy, deceased, and even unerupted teeth can have pulp stones. Hence, this study was conducted to evaluate the effect of orthodontic treatment on dental pulp.

MATERIALS & METHODS

A total of 20 subjects were enrolled with age ranging from 15 to 25 years. The panoramic radiographs of all the patients taken at the initiation of orthodontic

treatment for the purpose of diagnostic records and at the completion of the orthodontic treatment were studied for analysis of pulp stones. Maxillary and mandibular first and second premolar and molar teeth were selected for the purpose of the study. A total of 320 teeth of 20 subjects were studied. Required data was collected and analyzed by using SPSS software and chi-square test was done to find significant values with $p \leq 0.05$ and considered as a significant value.

RESULTS

A total of 20 subjects were enrolled. 8 were male patients and 12 were female patients. 1 out of 8(12.5%) male subjects were diagnosed with pulp stones before the orthodontic treatment and after completion of orthodontic treatment 2 out of 18 (25%) were found to have pulp stones. Among female patients, 2 out of 12 (16.7%) were diagnosed with pulp stones before the orthodontic treatment and after completion of orthodontic treatment, 3 out of 12

(33.4%) patients were found to have pulp stones. Among 20 cases, 3 (15%) cases reported pulp stones before the commencement of the orthodontic treatment and 5 in total (25%) cases after the completion of orthodontic treatment. Pulp stones were found in the age group 20 to 25 years.

On comparison of cases based on tooth- and archwise distribution, 17 (10.7%) out of 160 teeth showed the presence of pulp stones before orthodontic treatment, and 20 (12.5%) teeth showed the presence of pulp stones after orthodontic treatment in maxillary arch. 10 (6.25%) out of 160 teeth showed the presence of pulp stones before orthodontic treatment and 14 (8.75%) teeth showed the presence of pulp stones after orthodontic treatment in mandibular arch. Total of 320 teeth were evaluated in both arches, before orthodontic treatment were 27 (8.4%) and 34 (10.7%) teeth after orthodontic treatment. Maxillary first molar was found to be teeth with maximum number of pulp stones before and after orthodontic treatment.

Table 1: presence of pulp stone before and after orthodontic treatment

Parameters	Number	Presence of pulp stones before orthodontic treatment	Presence of pulp stones after orthodontic treatment	p-value
Gender	8			
Male	12	1 (12.5%)	2 (25%)	-
Female		2 (16.7%)	3 (33.4%)	
P- value	> 0.05			
Total number of patients	20	3 (15%)	5 (25%)	<0.06
Total number of teeth	320	27 (8.4%)	34 (10.7%)	<0.06

Table 2: arch wise and tooth wise comparison of pulp stones

Parameter	Number of teeth	Presence of pulp stones before orthodontic treatment	Presence of pulp stones after orthodontic treatment
Maxillary			
First premolar	40	1 (2.5%)	1 (2.5%)
Second premolar	40	2(5%)	2 (5%)
First molar	40	10 (25%)	13 (32.5%)
Second molar	40	4 (10%)	4 (10%)
Total number of teeth with presence of pulp stone in maxillary arch	160	17(10.7%)	20 (12.5%)
Mandibular			
First premolar	40	0 (0%)	1 (2.5%)
Second premolar	40	2 (5%)	2 (5%)
First molar	40	5(12.5%)	7 (17.5%)
Second molar	40	3 (7.5%)	4 (10%)
Total number of teeth with presence of pulp stone in mandibular arch	160	10(6.25%)	14 (8.75%)
Total number of teeth in both the arches	320	27(8.4%)	34 (10.7%)

DISCUSSION

The relation between orthodontic force application and dental pulp tissue has been the subject of studies in the recent years.⁹ However, there is no conclusive evidence on the effect of orthodontic forces on pulpal

tissue, and therefore, the issue has been studied for many years in human. Proffit et al.⁹ reported that light continuous forces have little or no effect on dental pulp. On the other hand, the reaction of dental pulp to orthodontic forces has been reported to vary

from mild hyperemia to complete necrosis in the literature.¹⁰ Type of the force application, duration and dimension of the force, age of the patients, and size of the apical foramen are among the contributory factors.¹¹ More pulpal changes have been observed in response to intrusive orthodontic forces.^{10,12} Hence, this study was conducted to evaluate the effect of orthodontic treatment on dental pulp.

In the present study, a total of 20 subjects were enrolled. 8 were male patients and 12 were female patients. 1 out of 8 (12.5%) male subjects were diagnosed with pulp stones before the orthodontic treatment and after completion of orthodontic treatment 2 out of 18 (25%) were found to have pulp stones. Among female patients, 2 out of 12 (16.7%) were diagnosed with pulp stones before the orthodontic treatment and after completion of orthodontic treatment, 3 out of 12 (33.4%) patients were found to have pulp stones. Among 20 cases, 3 (15%) cases reported pulp stones before the commencement of the orthodontic treatment and 5 in total (25%) cases after the completion of orthodontic treatment. Pulp stones were found in the age group 20 to 25 years. In one of the study by Bains SK et al, studied 500 routine dental outpatients within age group of 18–67 years were involved in the study. Molar bitewing of left and right side of each patient was taken with XCP bitewing instrument and size 2 film. The presence or absence of pulp stones was recorded. Overall prevalence of pulp stones was 41.8%. Pulp stones were significantly higher in maxilla (11.59%) than mandible (6.54%), left side than right side, and first molar than other molars. Higher numbers of pulp stones were recorded in patients with cardiovascular disease (38.89%) than with cholelithiasis and renal lithiasis. Conclusion. Pulp stones were higher in maxillary arch than mandibular arch and in females than males. Cardiovascular patients had higher number of pulp stones than other groups.¹³

In the present study, on comparison of cases based on tooth- and archwise distribution, 17 (10.7%) out of 160 teeth showed the presence of pulp stones before orthodontic treatment, and 20 (12.5%) teeth showed the presence of pulp stones after orthodontic treatment in maxillary arch. 10 (6.25%) out of 160 teeth showed the presence of pulp stones before orthodontic treatment and 14 (8.75%) teeth showed the presence of pulp stones after orthodontic treatment in mandibular arch. Total of 320 teeth were evaluated in both arches, before orthodontic treatment were 27 (8.4%) and 34 (10.7%) teeth after orthodontic treatment. Maxillary first molar was found to be teeth with maximum number of pulp stones before and after orthodontic treatment. Another retrospective study by Jena D et al, was carried out among 200 patients who underwent nonextraction orthodontic treatment. Maxillary and mandibular first and second premolar and molar teeth were selected for the purpose of the study using panoramic radiographs. A total of 3200

teeth of 200 patients were studied for the presence of pulp stones. Statistical analysis of the obtained data was carried out using Statistical Package for Social the Sciences (SPSS) version 22.0. Chi-square test was applied to find the significant value and $p \leq 0.05$ was considered as a significant value. In all, 11.5% of cases reported pulp stones before the commencement of the orthodontic treatment and 15.5% cases after completion of orthodontic treatment. Overall, 4% increase in cases were found which was statistically significant.¹⁴

The prolonged force appliance could determine dental pulp alterations that may culminate in a loss of vitality due to pulpal blood flow alterations.^{15,16} The characteristics of applied orthodontic forces, such as magnitude, appliance time and distribution, could contribute to blood flow disturbance and make the alteration reversibly or irreversibly.^{16,17} The literature shows conflicting results about the correlations of pulp changes incident to orthodontic force. Some reports suggested permanent damage to pulpal tissue from orthodontic force as tissue calcification and vascular alteration with vascular stasis and pulp necrosis but others supported no significant long-lasting effects of dental pulp.^{18,19}

CONCLUSION

The study showed the presence of pulp stones more in maxillary first molar and it was found to be teeth with maximum number of pulp stones before and after orthodontic treatment.

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