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Effects of Orthodontic Treatment on Pulp Stone Formation and Radiographic and Histopathological assessment of Pulp Stones.

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KEYWORDS

pulp stones, orthodontic treatment, histopathology
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ABSTRACT:

Background: This study was conducted to assess the Effects of Orthodontic Treatment on Pulp Stone Formation and Radiographic and Histopathological assessment of pulp stones.

Material and methods: This study comprised of 50 subjects who were undergoing orthodontic treatment. The subjects had been explained about the procedure and were asked to give written informed consent. those subjects who were willing to participate in the study had been included. The mean age of the subjects was 26.8 years. The prevalence of pulp stones formation was assessed and the radiographic and histopathological assessment of the pulp stones was carried out. Statistical analysis was conducted using SPSS software.

Results: In this study, there were total 50 subjects who underwent orthodontic treatment, of which, 23 cases showed the formation of pulp stones. There were 50 subjects of which 20 were male and 30 were female. Out of 23 cases of pulp stones, 19 cases were seen in females and 4 cases were seen in males. 17/23 pulp stones were seen in maxillary anterior region. Out of 23, 14 were true pulp stones, 5 were false pulp stones and 2 were free pulp stones. Also, 1 pulp stone each was of adherent type and embedded type.

Conclusion: The prevalence of pulp stones in subjects undergoing orthodontic treatment was 46%. The prevalence of pulp stones was high amongst females and the most common region where pulp stones were seen was maxillary anterior region. True, false, free, adherent and embedded type of pulp stones were evident, true type being the most common one.

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Introduction

Pulp stones (PS) are discrete calcified masses found in the dental pulp, in the pulp tissue or become attached to or embedded into the dentine.[1] Structurally, pulp stones can be classified as true or false, the former being made of dentine and lined by odontoblasts, whereas false pulp stones are formed from degenerating cells of the pulp that gets mineralized.[2]

The formation of pulp stones is still something of an enigma. Studies show that a high frequency of cell islands, considered to be of epithelial origin, were observed together with pulp stone formation in teeth that had been subjected to experimental intrusion.[3,4]A number of predisposing factors, including ageing, caries, operative procedures, as well as periodontal disease have been reported. The pathological effect of irritation by the microorganisms of dental caries on the pulpal tissue can cause a vascular wall injury, resulting in the deposition of calcium salts within the tissue.[5] Others are orthodontic tooth movement, idiopathic and genetic predisposing factors.

There are few studies on the relationship between orthodontic treatment and pulp calcification.[6,7] These studies had a small sample size, only including patients in a specific age range, and the length of their orthodontic treatment was brief; however, pulp stones were occasionally observed following orthodontic treatment.[8-10]

For instance, a study compared the effects of only extrusive and intrusive orthodontic forces on histological changes in the human dental pulp of 26 patients who were younger than 20 years and concluded that vacuolization and disruption of the odontoblastic layer showed statistically significant differences between teeth that underwent orthodontic forces and control teeth.[8] In another study, the effects of orthodontic force application on pulpal tissues were evaluated in 16 patients. Each had a sectional fixed appliance placed to extrude one premolar for only 14 days. The contralateral premolar was used as the control. After 14 days, both premolars were extracted, and no statistically significant difference was found in the number of fibroblasts and blood vessels. No morphological differences were observed between the control and test tissues after a 14-day period.[10]

This study was conducted to assess the Effects of Orthodontic Treatment on Pulp Stone Formation and Radiographic and Histopathological assessment of pulp stones.

Material and methods

This study comprised of 50 subjects who were undergoing orthodontic treatment. The subjects had been explained about the procedure and were asked to give written informed consent. those subjects who were willing to participate in the study had been included. The mean age of the subjects was 26.8 years. The prevalence of pulp stones formation was assessed and the radiographic and histopathological assessment of the pulp stones was carried out. Statistical analysis was conducted using SPSS software.

Results

Table 1: Prevalence of pulp stones in subjects undergoing orthodontic treatment.

Prevalence of pulp stones	Number of cases	Percentage
Absent	27	54
Present	23	46
Total	50	100

In this study, there were total 50 subjects who underwent orthodontic treatment, of which, 23 cases showed the formation of pulp stones.

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Table 2: Gender-wise distribution of subjects.

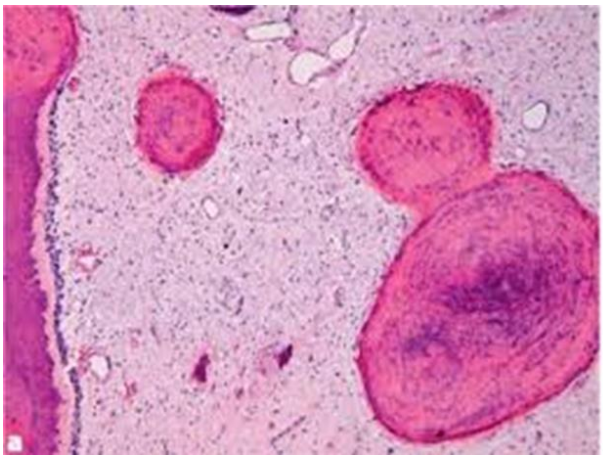
Gender	Number of subjects	Percentage
Male	20	40
Female	30	60
Total	50	100

There were 50 subjects of which 20 were male and 30 were female. Out of 23 cases of pulp stones, 19 cases were seen in females and 4 cases were seen in males. 17/23 pulp stones were seen in maxillary anterior region.

Table 3: Histopathological assessment of pulp stones.

Types of pulp stones	Number of cases	Percentage
True	14	60.86
False	05	21.7
Free	02	8.69
Adherent	01	4.34
Embedded	01	4.34
Total	23	100

Out of 23, 14 were true pulp stones, 5 were false pulp stones and 2 were free pulp stones. Also, 1 pulp stone each was of adherent type and embedded type.



Discussion

Pulp stones 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.[11] Healthy, deceased, and even unerupted teeth can have pulp stones.[12]

Half the teeth of young people and in almost all the teeth of people older than fifty years of age have pulp stones which are probably apparent microscopically.[11] Pulp degeneration, inductive interactions between epithelium and pulp tissue, age, circulatory disturbances in the pulp,

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nanobacteria[13], orthodontic tooth movements, idiopathic factors, genetic predisposition, fluoride supplementation[14], and Marfan syndrome[15] are the few factors which are implicated in pulp stones formation.

This study was conducted to assess the Effects of Orthodontic Treatment on Pulp Stone Formation and Radiographic and Histopathological assessment of pulp stones.

In this study, there were total 50 subjects who underwent orthodontic treatment, of which, 23 cases showed the formation of pulp stones. There were 50 subjects of which 20 were male and 30 were female. Out of 23 cases of pulp stones, 19 cases were seen in females and 4 cases were seen in males. 17/23 pulp stones were seen in maxillary anterior region. Out of 23, 14 were true pulp stones, 5 were false pulp stones and 2 were free pulp stones. Also, 1 pulp stone each was of adherent type and embedded type.

Jena D et al (2018).[16] The present study aimed to find prevalence of pulp stones in known South Indian orthodontic patients and to find correlation between pulp stones and patients who underwent orthodontic treatment as well as to reveal any differences due to gender, tooth type, and dental arches. The present retrospective study 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 $p < 0.05$ 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 ($p < 0.05$); 5.1% of total number of teeth were evaluated in both arches before orthodontic treatment and 6.3% of teeth after orthodontic treatment revealed the presence of pulp stones. Maxillary first molar was found to be teeth with maximum number of pulp stones before and after orthodontic treatment. The present study reported the prevalence of pulp stones to be increased by 4% in the pre- and posttreat-ment radiographs, which was statistically significant. The study found 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. However, further researches with larger samples are advisable.

Babanouri N et al (2023).[17] This retrospective study was aimed at determining the incidence of dental pulp stone formation during fixed orthodontic treatment. A total of 100 patients who received fixed orthodontic treatment were included in this study. Pre- and posttreatment panoramic radiographs of the patients were examined to identify pulp stones. The data were analyzed using McNemar's and Pearson's chi-square tests to investigate the correlations between having a dental pulp stone and gender, age, treatment type, and duration. Dental pulp stones were detected in 17% of patients on pretreatment panoramic radiographs and 35% of patients on posttreatment panoramic radiographs. The incidence of pulp stones sharply increased in the pre- and posttreatment radiographs (38%) ($P < 0.001$). In addition, there were associations between age, treatment duration, and the incidence of pulp stones ($P < 0.05$). Nevertheless, no associations were found between treatment type, gender, and the presence of pulp stones. Dental pulp stones were most frequently observed in first molars (62%), followed by second molars (36%). Fixed orthodontic treatment may trigger pulp irritation and calcification, resulting in the formation of pulp stones. Although pulp stones have no serious consequences, an orthodontist must consider the probability of pulp stone formation because it can cause difficulties in endodontic treatment.

Conclusion

The prevalence of pulp stones in subjects undergoing orthodontic treatment was 46%. The prevalence of pulp stones was high amongst females and the most common region where pulp stones were seen was maxillary anterior region. True, false, free, adherent and embedded type of pulp stones were evident, true type being the most common one.

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