

Detection of pulp stones in incisors by digital dental radiography

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ABSTRACT

Introduction: Pulp stones are calcifications of an uncertain etiology that are found in the pulp tissue and have variable sizes. They are found as single or multiple radiopaque circular or ovoid shaped images and are detected during routine radiographic examinations. A previous adequate planning to the endodontic treatment is necessary, and the detection of these alterations is part of this stage. Thus, our objective is to detect pulp stones in superior and lower incisors. **Methodology:** We used 793 digital periapical radiographs of the anterior teeth, totaling 2.999 teeth. The results were organized in Excel spreadsheets and submitted to a descriptive analysis and the Chi-Square test.² **Results:**

Results showed 15% of the teeth assessed had pulp stones and the most affected tooth was the right lateral incisor, 19% out of the total number of teeth. There was a higher prevalence in women aged between 51 and 60. **Conclusion:** The frequency of pulp stones in anterior teeth reaches 15% when they are assessed by digital periapical radiographs, with a higher prevalence in the female gender. Aging is associated with the occurrence of pulp stones. However, there is no association between the occurrence of restorations and the alterations.

Keywords: Dental pulp calcification. Endodontics. Digital dental radiography.

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Introduction

Pulp stones are calcifications with varied sizes that are located freely in the pulp cavity or adhering to the dentin tissue. They are products of cells that are less differentiated from the pulp and stimulated by different mechanisms of dentin repair.^{1,2}

Its etiology is still much discussed and can be attributed to several factors, such as patient's age, low-intensity stimulus, tooth decay, occlusal trauma, orthodontic movements, periodontal problems, epithelial remains, dental alterations and systemic disorders.^{1,2,3,4,5,6,7}

The detection of pulp stones occurs during routine radiographic exams, such as the digital periapical radiography. In these exams, the image of these alterations is radiopaque, oval or rounded, unique or multiple, and free or adhering to dentin tissues.^{1,2,3}

The digital periapical radiography is an essential diagnosis aid in Endodontics, since it allows a better view of structures and objects, compensating the possible flaws in the distinction of density and contrast of the gray shades of analogical images.⁹

The occurrence of pulp stones doesn't cause greater problems for the tooth affected; however, its diagnosis is important for planning an appropriate endodontic treatment. Thus, the objective of this study was to determinate the prevalence of pulp stones in the anterior teeth by digital periapical radiography and assess its association with age, gender and the occurrence of restorations.

Material and methods

This study is registered with the Research Ethics Committee under the number: 87502-210.

Since the objective was to evaluate the frequency of the occurrence of pulp stones, we used 793 digital periapical radiographs of the anterior teeth. All radiographs were from the image bank of UNIPAR and they had been performed from March 2012 to May 2014.

The sample consisted of the following teeth: lower left central incisor 31, lower left lateral incisor 32, lower right central incisor 41, lower right lateral incisor 42, upper right central incisor 11, upper left central incisor 21, upper right lateral incisor 12, upper left lateral incisor 22.

The total sample consisted of 2999 teeth, including restored, decayed, included, and healthy teeth. The images were from patients of both genders and all ages.

The periapical radiographs were performed in an equipment of periapical radiography Timex 70 (E-GNATUS – Equipamentos Médicos Odontológicos LTDA., Ribeirão Preto-SP, Brazil) with specifications of 70 Kvp and 8m.a, and exposure time of 0.28 seconds.

The digital images were obtained by the digital indirect system EXPRESST (Intrumentarium Dental, Tuusula, Finland).

The images were assessed by two examiners (radiologists) by the software Clini ViewT (Dental Imaging Software). These examiners had been calibrated, before the beginning of the research, in a dark area, using appropriate monitor and computer. We considered as pulp stones the round radiopaque images, oval or sharp, occurring in the pulp cavity and inside the radicular duct (Images 1 and 2). Data were organized in Excel spreadsheets, and, then, submitted to a descriptive analysis and the Chi-square test by the STATISTICA 7.0 software.

Results

It is possible to observe in Table 1 that from the total of 2999 teeth from 418 patients, 436 or approximately 15% of the teeth have pulp stones.

The most affected tooth by the pulp node alteration was the 42, with approximately 19% of all teeth affected. The teeth 31, 32, and 41 also showed with a frequency above 15%. Finally, the first and second quadrant teeth had a frequency of affected teeth around 8% (Table 2).

The chi-square test was performed to verify the association of age and occurrence of pulpal stone alteration in the teeth. As the p-value is very small, close to 0, we can conclude we have a sampling evidence that there is an association between the patients' age and the occurrence of the nodule-pulp alteration at a 5% level. Such alterations are more frequent among patients aged 51 to 60 years old (Group 6), representing 25% of the affected teeth; followed by patients aged between 41 and 50 years old (Group 5), representing 24% of the affected teeth; and by patients aged 31 to 40 years old (Group 4), with 23% of the teeth with alterations (Table 3). Given the results of the residual analysis and the percentages shown in Table 3, the general conclusion is that groups 1 (patients up to 10 years of age) and 7 (patients over 61 years of age) do not differ significantly.



Figure 1. Occurrence of pulp stones in the teeth 21.

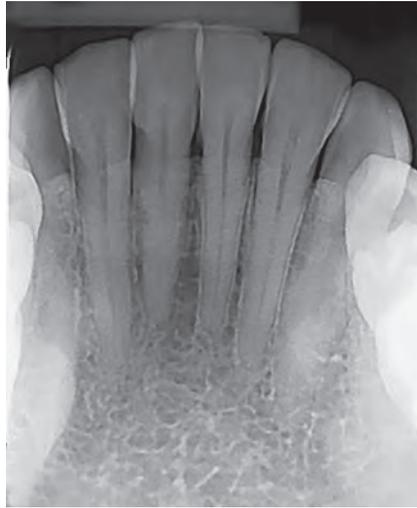


Figure 2. Occurrence of pulp stones in the tooth 31.

Table 1. Affected teeth and their percentage

Teeth	Number of Affected Teeth	% Affected Teeth
11	36	8,26%
12	27	6,19%
13	0	0,00%
21	39	8,94%
22	32	7,34%
31	75	17,20%
32	77	17,66%
41	68	15,60%
42	82	18,81%
Total	436	100%

To verify the distribution of teeth with pulp stones according to gender, we repeated the chi-square test, in which the p-value obtained was 0.008554, with a level of significance of 1%. Thus, we can conclude that we reject the null hypothesis, that is, there is no association between the occurrence of pulp stone alteration and the patient's gender (Table 4).

Taking into account the association between the occurrence of pulp stones and restorations, it is possible to observe that there is no association between the occurrence of restorations and pulp nodules since from the 436 teeth that presented pulp stone, only 56 had the presence of restoration. In other words, 12.84% of teeth had pulp stone and restoration (Table 5).

Table 2. The occurrence of teeth affected by alterations and patients' age in 2999 teeth from 418 patients.

AFFECTED BY ALTERATIONS	PATIENTS' AGE							TOTAL
	Group 1 Before 10 age	Group 2 11 to 20	Group 3 21 to 30	Group 4 31 to 40	Group 5 41 to 50	Group 6 51 to 60	Group 7 > 61 age	
YES	1	104	77	110	77	31	36	436
NO	19	1006	569	376	242	95	256	2563
TOTAL	20	1110	646	486	319	126	292	2999

Table 3. Percentage of occurrence of teeth affected by alterations and patient age in 2999 teeth from 418 patients.

AFFECTED BY ALTERATIONS	PATIENTS' AGE						
	Group 1 Before 10 age	Group 2 11 to 20	Group 3 21 to 30	Group 4 31 to 40	Group 5 41 to 50	Group 6 51 to 60	Group 7 > 61 age
YES	5%	9%	12%	23%	24%	25%	12%
NO	95%	91%	88%	77%	76%	75%	88%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Table 4. The occurrence of teeth affected by alterations and restored teeth in 2999 teeth from 418 patients.

Number of teeth without stones	Number of teeth with stones	Number of teeth with stones and restoration	Number of teeth with stones and without restoration
2563	436	56	380
85.46%	14.54%	12.84%	87.16%

Table 5. The occurrence of teeth affected by alterations and patients' gender in 2999 teeth from 418 patients.

Affected by alterations	Patients' Gender		Total
	Female	Male	
No	1.549	1.014	2.563
YES	293	143	436
Total in general	1.842	1.157	2.999

Discussion

Pulp stones are detected during routine imaging examinations; they appear as single or multiple radiopaque images with a circular or ovoid shape. In these types of examination, it is only possible to see them when they reach a size larger than 200 micrometers. Thus, depending on the group of teeth studied, as well as the types of radiographic examinations used, the prevalence of pulp stones reaches values ranging from 8 to 90%, and they are directly influenced by the methodology used.^{1,9,10,11,12,13}

In this study, we analyzed 793 digital periapical x-rays and verified 2999 anterior incisors. We found a 15% prevalence of teeth with pulp stones agreeing with other studies by Gulsahi et al.⁹ and Hamasha & Darwazeh¹², which used different methodologies, but with a lower prevalence than studies by Ranjitkar¹¹ et al. and Rodrigues et al.¹²

As to the percentage of affected teeth, tooth 42 was the most affected, with approximately 19% of the total, followed by all other lower incisors with a frequency above 15%, whereas the upper incisors had

only about 8%. These data disagree with the results of other studies, in which the number of affected upper incisors was higher concerning the lower incisors,¹² but agrees with the results of Roberts et al.¹³, in which, by cone-beam tomography, the number of lower incisors was higher than that of superiors.

The association between the increase in the prevalence of pulp stones with aging^{9,10} was found in our research. The highest prevalence of pulp stones involved patients aged between 51 to 60 years old, with 25%; followed by patients aged between 41 and 50 years old; and 31 and 40, respectively; however, some authors do not confirm this association.^{12,13}

The association of the pulp node with the gender of the patient showed a higher prevalence in females, 15% compared to males with only 12%, and agrees with the studies by Stafne et al.², in which 24.7% of patients with alterations were female, and 16.9% males. These data also agree with the study by Gulsahi et al.⁹, in which the prevalence was higher for males, but considering only the incisors, the most affected was also the female.

Therefore, the frequency of pulpal stones for the anterior teeth reaches 15% when evaluated by digital periapical x-rays, it has a higher prevalence in females, the prevalence of pulpal stones increases with aging, and there is no association with the occurrence of restorations.

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