Statistical evaluation of radiologic survey of pulp stones

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Pulp stones are a form of calcification found in dental pulp. “True” pulp stones histologically resemble dentin, and “false” pulp stones are composed of a localized mass of calcified materi­al.' A third type, “diffuse” or “amor­phous” pulp stones, was described by Mjor and Pindborg2 as more irregular in shape than false pulp stones, occur­ring in close association with blood vessels. Slenvik and Mjor’ suggested that pulp stones may be formed in response to detached cells of the inner enamel epithelium. Baume4 defined pulp stones as a paraphysiologic phe­nomenon wherein new dentin is formed. These pathologic degenera­tions, sometimes called “calcific degen­erations” or “denticles,” should be classified according to Baume’s dentin taxonomy as “intrapulpal calcifica­tions.”

Pulp stones range in size from small microscopic particles to stones large enough to sometimes obliterate the entire pulp chamber? William0 found areas of pulp calcification in 87% of the teeth examined, but he was able to observe only 15% of the calcifications radiographically. James and others7 found mineralization of the pulp in 56% of the young permanent teeth studied, and Stafne and Szabo3 found pulp stones in 46% of the 200 teeth studied. Hill9 observed that the fre­quency of occurrence of pulp stones did not di Her either according to sex of the patient or among the various teeth in the dental arch. Likewise, Sundell and others' found no significant corre­lation between formation of pulp stones and sex. We do, however, share the opinion expressed by Stafne and Szabo8 that pulp nodules occur more frequently in females than in males.

The primary purpose of the current study was to statistically evaluate, using dental radiographs, the preva­lence of radiographically visible pulp stones in the pulp chambers of man­dibular premolars and molars in male and female patients. Because local fac­tors, especially the type of operative procedure used, have been suggested as those being associated with the formation of pulp stones?-811’” we also examined the correlation between the condition of the crown (intact, carious, or restored) and the presence of pulp stones.

METHODS AND

MATERIALS

Full-mouth radiographic surveys and bitewing radiographs of 150 female patients and 150 male patients, aged 20 to 40 years, were chosen at random from the files of Tel Aviv University School of Dental Medicine. Medical examination of the patients was not contributory. A total of 1,380 mandibular premolars and molars (679 in female patients, 701 in male patients) were selected for evaluation. (It was assumed that with the bisecting angle technique pulp stone detection would be easier for mandibular maxil­lary teeth.) The condition of the crown was evaluated radiographically and recorded either as intact, carious, or restored.

The radiographic examination fo­cused solely on the pulp chambers, using an X-ray viewer and magnifying glass. Pulp stones were recorded only when a definitive radiopaque mass could be seen in the pulp chamber.

RESULTS

Distribution of the pulp, according to condition and location of the teeth and the sex of the patient, is summa­rized in Table 1.

Of the 1,380 teeth examined, 20.7% were found to contain pulp stones. Pulp stones were found in 24.7% of the 679 teeth in the female group (Table 2) and 16.9% of the 701 teeth in the male group (Table 3).

Results were evaluated by Chi­square analysis described by Spiegel.12 The number of pulp stones found in the female group was statistically higher than the number in the male group (P<.0001). In addition, as shown in Tables 2 and 3, teeth 36 and 46 in both female and male groups showed a higher percentage of pulp stones.

The sum of Chi square and *P* values for all teeth is indicated in Table 4. No significant difference was found between the presence of pulp stones and the condition of the crown of the tooth (intact, carious, or restored).

When periapical radiographs were compared with bitewing radiographs for usefulness in diagnosing pulp stones in the pulp chamber, differences were found for only 14 of the 1,380 teeth evaluated.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (Mandibular) | Female | Male | Female | Male | Female | Male | Female | Male |
| Left first pre­molar | 88 | 85 | 36 | 27 | 17 | 26 | 136 | 138 |
| Left second  premolar | 46 | 53 | 35 | 31 | 37 | 30 | 118 | 114 |
| Left first mo­  lar | 9 | 14 | 15 | 65 | 62 | 86 | 86 |  |
| Right first  premolar | 79 | 77 | 33 | 36 | 24 | 25 | 136 | 138 |
| Right second  premolar | 37 | 52 | 31 | 44 | 40 | 27 | 108 | 123 |
| Right first  molar | 8 | 15 | 16 | 20 | 71 | 67 | 95 | 102 |
| Total | 265 | 291 | 165 | 173 | 249 | 237 | 679 | 679 |

Table 1 • Distribution of the pulp stones according to condition and location of the teeth and the sex of the patient.

Tooth

Location

intacı

Carious

Restored

Total

Tooth

location  
(mandibular)

Left first pre­molar

Left second premolar

Left first mo­lar

Right first premolar

Right second premolar

Right first molar

Total

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Intact | | | Carious | | Restored | | | Total | | | |
| Total | No. of stones | % | Total | No. of stones | % | Total | No. of stones | % | Total | No. of stones | % |
| 88 | 4 | 4.5 | 36 | 1 | 2.7 | 12 | 1 | 8.3 | 136 | 6 | 4.4 |
| 46 | 6 | 13.0 | 35 | 2 | 5.7 | 37 | *6* | 16.2 | 118 | 14 | 11.9 |
| 7 | 4 | 57.1 | 14 | 10 | 71.4 | 65 | 42 | 64.6 | 86 | 57 | 66.3 |
| 79 | 5 | 6.3 | 33 | 4 | 12.1 | 24 | 4 | 16.6 | 136 | 13 | 9.6 |
| 37 | 3 | 8.1 | 31 | 3 | 9.6 | 40 | 4 | 10.0 | 108 | 10 | 9.3 |
| 8 | 8 | 100.0 | 16 | 12 | 75.0 | 71 | 48 | 67.6 | 95 | 68 | 71.1 |

Table 2 • Percentage of pulp stones in the six teeth and crown conditions in the female group.

679 168 24.7

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Tooth  location | | Intact | Carious | | |
| (mandibular) | Total | No. of stones | % | Total | No. of stones |
| Left first pre- | 85 | 7 | 8.2 | 27 | 4 |
| molar |  |  |  |  |  |
| Left second | 53 | 1 | 1.8 | 31 | 3 |
| premolar  Left first mo- | 9 | 4 | 44.4 | 15 | 5 |
| lar |  |  |  |  |  |
| Right first | 77 | 6 | 7.7 | 36 | i |
| premolar  Right second | 52 | 4 | 7.6 | 44 | 0 |
| premolar  Right first | 15 | 8 | 53.3 | 20 | 9 |
| molar |  |  |  |  |  |
| Total |  |  |  |  |  |

Table 3 • Percentage of pulp stones in the six teeth and crown conditions in the male group.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | Restored | | | Total | |
| % | Total | No. of stones | % | Total | No. of stones | /£> |
| 14.8 | 26 | 1 | 3.8 | 138 | 12 | 8.7? |
| 9.6 | 30 | 2 | 6.6 | 114 | 6 | 5.3 |
| 33.3 | 62 | 24 | 38.7 | 86 | 34 | 39.5 |
| 2.2 | 25 | 3 | 12.0 | 138 | 10 | 7.2 |
| 0 | 27 | 3 | 11.1 | 123 | 5 | 4.4 |
| 45.0 | 67 | 34 | 50.7 | 102 | 52 | 51.0, |
|  |  |  |  | 701 | 119 | 16.? |

| T ooth no. | X2 | df | p |
| --- | --- | --- | --- |
| Left first premolar | 2.05 | 1 | 0.55 |
| Left second premolar | 3.21 | 1 | 0.07 |
| Left first molar | 12.34 | 1 | 0.00004 |
| Right first premolar | 0.48 | 1 | 0.49 |
| Right second premolar | 2.56 | 1 | 0.11 |
| Right first molar | 8.00 | 1 | 0.0031 |

Table 4 • Sum of chi-square and *P* Values for the teeth evaluated.

DISCUSSION

As pulp stones can be disclosed clinically only with dental radiogra­phy, our statistical evaluation was based on radiographic survey. We thought the stones would be better seen using bitewing radiographs rath­er than periapical radiographs because the central beam in the bitewing radio­graphs is perpendicular to the long axis of the tooth, whereas distortion occurs in the bisecting technique. However, results'indicated differences in only 14 of the 1,380 teeth evalu­ated.

Since 1933 when Stafne and Szabo8 reported that pulp stones are more common in females than in males, no other studies regarding this subject have been published in the periodic literature or in the dental textbooks. The results of the current study statis­tically confirm those findings.

The group of teeth examined in our study included mandibular premolars and first molars; the statistical signifi­cance *(P <* .00004 for tooth no. 36; *P <* .0031 for tooth 46; *P <* .0001 for the total number of teeth represented by both groups, males and females) assures that this tendency exists in other teeth as well. It may, therefore, be postulated that the aforementioned findings are a manifestation of the hormonal differences between the sexes; however, this has yet to be proved.

A higher prevalence for pulp stones was observed in molars compared with premolars. In the male group, pulp stones were found in 45.2% of molars and in only 6.1% of the premolars. In the female group, pulp stones were found in 65.9% of the molars com­pared with only 5.8% of the premolars. Shafer and others,1 Seltzer and Bend­er14 and Sicher15 claimed that calcifica­tions, in general, increased with advancing age. Therefore, the higher prevalence of pulp stones in the molars may be caused by the earlier eruption of the molars compared with premo­lars, exposing molars for more time to possible degenerative changes. In addi­tion, molars have a better blood supply and more pulp tissue than premolars,16 which may enhance conditions that can cause calcifications. It has been assumed17 that the formation of pulp stones is congenital because in some patients all the teeth are filled with stones.

The correlation between chronic trauma to the pulp and pulp calcifica­tions has been discussed before in the literature. Sundell and others5 sug­gested that the formation of coronal pulp stones may represent a previously overlooked late response after an inflammatory process in the pulp. Such processes occur frequently after operative procedures, such as large restorations; more chronic causes (car­ies, periodontal disease, abrasion, and erosion) have also been cited.7 Our study, however, did not indicate any significant difference among intact teeth, teeth with caries, or restored teeth in relation to propensity to devel­op pulp stones.

In conclusion, the results of this study show that female patients are statistically more predisposed to devel­oping pulp stones than male patients; no significant difference was observed in the incidence of pulp stones among intact, carious, and restored teeth; and no significant difference was seen between periapical and bitewing radi­ography in disclosing pulp stones.

SUMMARY

Full-mouth radiographic surveys and bitewing radiographs of 150 male and 150 female patients aged 20 to 40 years were evaluated for the presence of pulp stones in the pulp chambers of the mandibular premolars and molars. Results indicated that of the 1,380 teeth examined, 20.7% contained pulp stones. Significantly more pulp stones were found in female patients (24.7%) than in male patients (16.9%) *(P <* .0001). This difference was more significant for molars: mandibular left first molar (P < .00004) and mandib­ular right first molar (P<.0031).7 There were significantly more pulp stones in the mandibular molars than in the premolars in both groups, but no significant difference was found in the prevalence for pulp stones among the three recorded conditions of the crown. Comparison of periapical and bitewing radiographs showed no sig­nificant difference in the diagnosis of pulp stones.

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