Radiographic Assessment of the Prevalence of Pulp Stones in Malaysians

Sathya Kannan, BDS, MDS, MFDS, RCSEd, Sham Kishor Kannepady, BDS, MDS, Kavitha Muthu, BDS, MDS, Matada Basavarajaiah Jeevan, BDS, MDS, and Arishiya Thapasum, BDS, MDS

Abstract

Introduction: The aim of this study was to determine the prevalence of pulp stones in the Malaysian population using radiographs, and to assess the association of pulp stones with gender, age, tooth type, dental arch and tooth status. Occurrence of pulp stones among the three races in Malaysia (Malay, Chinese and Indians) was also studied. **Methods:** A retrospective study was performed from a random sample of 361 dental records in AIMST Dental Centre, Faculty of Dentistry, AIMST University, Kedah, Malaysia. Data were collected from patient files and 507 intraoral periapical radiographs. All radiographs were examined by an oral radiologist to identify pulp stones and associated factors. Statistical analysis was performed using the Pearson chi-square test. **Results:** Of the 361 patients, 205 were female and 156 were male. Pulp stones were identified in 162 (44.9%) subjects in 1 or more teeth and in 280 (15.7%) teeth of the total 1779 teeth examined. Pulp stones were found significantly more in molars and teeth that were not intact (carious/restored/both carious and restored). There was no significant correlation with sex, increasing age, dental arches, and ethnic races. **Conclusions:** The prevalence of pulp stones in the Malaysian population studied was 44.9%. Pulp stones were more often seen in teeth that were restored or affected with caries. These findings require further investigation. *(J Endod 2015;41:333–337)*

Key Words

Forensic odontology, pulp calcification, pulp stones

From the Academic Unit of Craniofacial Clinical Care, Faculty of Dentistry, AIMST University, Kedah, Malaysia.

Address requests for reprints to Dr Sathya Kannan, Faculty of Dentistry, AIMST University, Bedong 08100, Kedah, Malaysia. E-mail address: drsathyas@yahoo.com

0099-2399/$ - see front matter

http://dx.doi.org/10.1016/j.joen.2014.10.015

Pulp stones are discrete calcified bodies found in the dental pulp. They have calcium phosphorous ratios similar to dentin and can be seen in healthy, diseased, or even unerupted teeth (1–3). These pulp stones, also known as denticles, may exist freely within the pulp tissue or be attached or embedded in the dentin. They are found more frequently at the orifice of the pulp chamber or within the root canal. A tooth may have pulp stones of varying sizes, from minute particles to large masses, which can occlude the pulp space (1, 4). They are seen in all tooth types but occur most commonly in molars (2, 5, 6). Radiographically, pulp stones appear as radiopaque structures in the pulp space that frequently act as an impediment during endodontic treatment (1, 2).

Structurally, pulp stones can be classified as true or false. True pulp stones are rare and contain dentin with distinct dentinal tubules lined by odontoblasts. False pulp stones contain concentric layers of mineralized tissue formed by surface accretion around blood thrombi, dying or dead cells, or collagen fibers (1). Hence, it is presumed that true pulp stones arise as a result of epithelial-mesenchymal interactions, whereas false pulp stones arise from degenerating cells of the pulp that eventually get mineralized (5). Other etiologic factors that have been implicated in pulp stone formation include increasing age, circulatory disturbances in the pulp, orthodontic tooth movement, transplantation of teeth, and trauma (2, 7). Pulp stones have been associated with systemic problems like cardiovascular disease and systemic sclerosis (8, 9). A genetic predisposition has also been noted, and sometimes its occurrence is considered idiopathic. Genetic disorders like dentin dysplasia, dentinogenesis imperfecta, and Van der Woude syndrome are associated with an increased occurrence of pulp stones (2, 7, 10, 11).

Pulpal calcifications can develop throughout life, and studies have reported prevalence rates from 8%–90% (12). The prevalence of pulp stones in teeth based on radiographic examinations has been reported to be around 20%–25% (6, 13, 14), whereas histologic examinations yield higher prevalences (2, 15). In a radiographic study on the Iraqi population, Baghdady et al (6) reported pulp stones in 19.2% of the teeth examined. Hamasha and Darwazeh (13) identified pulp stones in 22.4% of 4573 teeth examined in Jordanian adults, and Ranjitkar et al (2) noted pulp stones in 10.1% of teeth examined in the Australian population. In Turkish dental patients, Gulsahi et al (16) reported pulp stones in 5% of 13,474 teeth examined.

A literature review showed many reports on pulp stones; however, no data were available regarding pulp stones in the Malaysian population. The purpose of this study was to determine the prevalence of pulp stones in Malaysians using radiographs and to investigate any association between the occurrence of pulp stones with sex, age, tooth type, dental arch, and tooth status. In Malaysia, the population is largely composed of 3 major ethnic backgrounds (Malays, Chinese, and Indians), which further permitted us to compare the occurrence of pulp stones among racial groups.

Materials and Methods

A random sample of 1000 dental records of patients who were treated at the AIMST Dental Centre, Faculty of Dentistry, AIMST University, Kedah, Malaysia, were reviewed. Records of patients between the ages of 10 and 70 years, which contained intraoral periapical radiographs of diagnostic quality, were included in the study. The final sample

TABLE 1. The Distribution of Pulp Stones by Sex

Sex	No. of patients examined	No. of patients with pulp stones	% of patients with pulp stones
Male	156	60	38.5
Female	205	102	49.8
Total	361	162	44.9

The chi-square test is not statistically significant for pulp stone occurrence between sexes ($P = .185$).

consisted of 361 patient records that had 507 intraoral periapical radiographs of diagnostic quality. All radiographs were taken in the oral radiology department using the parallel cone technique. A total of 1779 teeth were examined from these radiographs; only permanent teeth with complete roots were analyzed.

All radiographs were read by 1 of the authors (S.K.K.) who is a specialist in oral radiology using an x-ray viewer and a magnifying glass in a dimmed room, focusing attention on pulp stones. A tooth was scored as having a pulp stone when a definite radiopaque mass was observed in the pulp space. The status of teeth (caries, restorations, periodontal disease, periapical pathology, and other tooth abnormalities that can be appreciated on radiographs) having pulp stones was also assessed. The data were recorded in a detailed spreadsheet prepared for the study.

Examiner reliability was calculated by rereading a random sample of 10% (51) of the total radiographs previously examined. A 99% agreement was obtained, indicating that the scoring methods were highly reliable.

The data were statistically analyzed using the Pearson chi-square test of significance to report any association of pulp stone occurrence with sex, age, race, tooth type, dental arch, and tooth status.

Results

The prevalence of pulp stones studied in the Malaysian population is presented as follows.

Overall Prevalence of Pulp Stones and Distribution between Sexes

Of the 361 subjects examined, 156 were males and 205 were females. Among the total 361 subjects, 162 (44.9%) had pulp stones in 1 or more teeth. A total of 60 (38.5%) male and 102 (49.8%) female subjects exhibited pulp stones (Table 1). The overall difference in distribution between the sexes was not statistically significant ($P = .185$).

TABLE 2. The Distribution of Pulp Stones by Age

Patient age (y)	No. of patients examined	No of patients with pulp stones	% of patients with pulp stones
10–19	22	3	13.6
20–29	139	58	41.7
30–39	56	26	46.4
40–49	70	39	55.7
50–59	44	25	56.8
60–70	30	11	36.7
Total	361	162	44.9

The chi-square test is not statistically significant for pulp stone occurrence between different age groups studied ($P = .232$).

TABLE 3. The Distribution of Pulp Stones by Race

Race	No. of patients examined	No. of patients with pulp stones	% of patients with pulp stones
Indian	192	101	52.6
Chinese	132	49	37.1
Malaysian	37	12	32.4
Total	361	162	44.9

The chi-square test is not statistically significant for pulp stone occurrence among the races ($P = .140$).

Pulp Stone Distribution among Age Groups

The distribution of patients having pulp stones according to age groups is shown in Table 2. There was a higher prevalence in patients 50–59 years of age (56.8%) when compared with the other age groups. There was no significant difference between the age groups ($P = .232$).

Pulp Stone Distribution among the 3 Races in Malaysia

Among the ethnic groups (Malays, Chinese, and Indians), the Indian population (52.6%) had more pulp stones as reflected in Table 3. Although the races in Malaysia showed variations in the occurrence of pulp stones, there was no significant difference between them ($P = .140$).

Pulp Stone Occurrence in Tooth Types and Dental Arches

Pulp stones were detected in 280 (15.7%) of the 1779 teeth examined. The frequency distribution and percentages of pulp stones among different teeth and arches are shown in Table 4. The occurrence of pulp stones in the mandibular (15.5%) and maxillary (15.9%) arches were almost equal. There was a significant association between pulp stone occurrence and dental arches ($P < .05$).

Of the teeth exhibiting pulp stones, the maxillary left second molar showed the highest occurrence (36.5%) followed by the mandibular right second molar (30.4%). A relatively low frequency was seen in mandibular incisors followed by maxillary left first premolars (3.2%), which were the least affected teeth. Pulp stone occurrence in first and second molar teeth was significantly higher ($P < .05$).

Pulp Stones and Tooth Status

The status of teeth with pulp stones was assessed for caries, restorations, and other abnormalities. Among the 280 teeth with pulp stones, 106 teeth (37.9%) were not intact as shown in Table 5. Statistical analysis showed a significant association between pulp stone occurrence and nonintact teeth ($P < .05$). Among the 106 teeth that were not intact, 84 (79.2%) teeth had restorations, 9 (8.5%) teeth had secondary caries, and 13 teeth (12.3%) had caries. Periodontal disease and periapical pathology were present as additional findings in 3 and 2 nonintact teeth with pulp stones, respectively; however, the association was not statistically significant. In addition, pulp stones were not associated with any other tooth abnormalities (both developmental and acquired).

Discussion

The detection of pulp stones using dental radiographs is possible when they are larger than 200 μm in diameter (12). Although the true prevalence is likely to be higher in microscopic examinations of teeth than figures from radiographic studies (5, 12), the latter is the only noninvasive technique available for evaluating pulp stones in clinical investigations (2). Furthermore, in histologic observations, the limited number of sections through each tooth may result in underreporting