

CLINICAL ARTICLE

Prevalence of Pulp Stones in a Teenage Iraqi Group

Virgin S. Baghdady, BDS,MS, Leonora J. Ghose, BDS,MDS, and Huda Y. Nahoom, BDS

The prevalence of pulp stones was evaluated radiographically in 515 randomly selected 13- to 14-year-old Iraqi secondary school children. Pulp stones were found in 19.2% of the teeth examined and more were found in the male group than in the female group.

In general, significantly more pulp stones were found in mandibular teeth than maxillary teeth, meanwhile the first molar tooth showed statistically more pulp stones than second molars and premolars in both jaws in both sexes. Slightly higher percentages of stones were found in carious teeth compared with intact teeth, but in the first molars (except for the mandibular first molar in males) the incidence of pulpal calcifications seems to be much lower in carious teeth.

Pulp stones (denticles or nodules) are calcified masses, found commonly in the dental pulps of healthy, diseased, and even unerupted teeth (1). Their locations are more in the coronal than radicular portions of the pulp organ and can be seen as free, attached, and embedded (2, 3). They are classified according to their structure as true, false, and diffuse (4). Their size varies greatly and can be determined more accurately histologically than radiographically (5-8).

The incidence of pulp stones varies according to different studies. James et al. (9) found pulpal stones in 56% of young permanent teeth, Stafne and Szabo (10) found them in 46% of 200 teeth studied, Tamse et al. (11) reported 20.7% in a total sample of 300 patients and more in females than in males. A similar sex variation was found by Stafne and Szabo (10), whereas other investigators have reported no sex difference (6, 8, 12).

Although the exact cause of pulp calcification is unknown, it is clearly shown that the incidence of pulp stones increases with age (4, 6, 8, 13). Hill (8) reported a 66% incidence of pulp stones in 10- to 20-year olds and 90% in those between 50 and 70 years old. Sayeghand Reed (13) demonstrated that dental caries acts as a local factor which increases the incidence of pulpal calcification in teeth of children and young adults. On

the other hand Tamse et al. (11) found no significant difference between the presence of pulp stones and the condition of the crown.

The aim of this study was to evaluate the radiographic prevalence of pulp stones in a 12- to 13-year-old Iraqi group and to correlate the condition of the crown (carious or intact) and the presence of pulp stones in premolars and molars in both jaws.

MATERIALS AND METHODS

Five-hundred and fifteen 12- to 13-year-old randomly selected school children (242 male and 273 female) were selected for this study from Hai-Almualmeen in Baghdad, a residential district of middle socioeconomic status. Medical examination of the participants was not contributory.

A total of 6,228 maxillary and mandibular premolars and molars (2,880 in male students and 3,348 in female students) were selected for evaluation. A bite-wing radiograph was prepared for each jaw by using the Rinn bite-wing block paralleling technique with a dental X-ray machine with a 16-inch cone (Fig. 1). Kodak DF size 2 film was exposed at 65 kVp and 10 mA and was then processed in an automatic processor. Radiographic observation was conducted by one

FIG1. Bite-wing radiographs were prepared by using the Rinn bite-wing block paralleling technique.

examiner and focused on pulp stones in the coronal pulp chamber and on caries detection, using a radiograph viewer and a magnifying glass. Pulp stones were recorded only when a definitive radiopaque mass could be seen in the pulp chamber. The condition of the crown was evaluated by clinical dental examination using plane mouth mirrors and sharp explorers. On this basis, a diagnosis was made of carious or intact crowns and was duly recorded. No attempt was made to determine the severity of the carious lesions. The data were evaluated by chi-square analysis for statistical significance.

TABLE 1. Distribution of teeth according to location, condition, and sex of the patient

Tooth Location		Intact		Carious		Total	
		M	F	M	F	M	F
Pi	Max*	217	330	109	90	326	420
	Mand	348	360	30	43	378	403
P2	Max	253	311	135	114	388	425
	Mand	322	355	96	113	418	468
MI	Max	103	139	301	307	404	446
	Mand	126	97	298	353	424	450
M ₂	Max	39	151	79	100	118	251
	Mand	230	263	194	222	424	485
Total		1638	2006	1242	1342	2880	3348

* Max, maxillary; Mand, mandibular.

RESULTS

Distribution of the teeth according to the location, condition, and sex of the patient is summarized in Table 1. Of the 6,228 teeth examined, 19.2% were found to contain pulp stones. Pulp stones were found in 18.8% of 3,348 teeth in the female group (Table 2) and 19.8% of the 2,880 teeth in the male group (Table 3). The difference was not significant ($\chi^2 = 1.0$, $p < 0.3$).

The mandibular teeth showed a significantly higher number of pulp stones than the maxillary teeth in the total sample studied ($\chi^2 = 4.7$, $O_p < 0.03$). Moreover, the mandibular first molar showed a higher percentage of pulp stones than second molars and premolars in both jaws for both sexes (Tables 2 and 3).

No significant difference was found between intact teeth and carious teeth in the number of pulp stones, except in the first molars (except for the mandibular first molar in males) where the incidence of palpal calcifications seemed to be much lower in carious teeth (Table 4).

DISCUSSION

Clinical detection of pulp stones can be observed by dental radiograph only (14). The evaluation of this survey on pulp stones was based on the bite-wing paralleling technique rather than periapical radiographs, since distortion could occur in

TABLE2. Percentage of pulp stones in the posterior teeth in the maxilla, mandible, and crown condition in the female group

Tooth	Location	Intact Teeth			Caries Teeth			Total		
		No.	With Stone	%	No.	With Stone	%	No.	With Stone	%
p	Max*	330	10	3	90	4	4.4	420	14	3.3
	Mand	360	26	7.2	43	7	16.3	403	33	8.2
D ₂	Max	311	3	1.0	114	3	2.6	425	6	1.4
	Mand	355	5	1.4	113	2	1.8	468	7	1.5
Nh	Max	139	106	76.3	307	107	34.9	446	213	47.8
	Mand	97	79	81.4	353	149	42.2	450	228	50.7
M ₂	Max	151	21	13.9	100	16	16	251	37	14.7
	Mand	263	50	19.0	222	40	18	485	90	18.6
Total	Max	931	140	15.0	611	130	21.3	1542	270	17.5
	Mand	1075	160	14.9	731	198	27.1	1806	358	19.8
Total	Max + mand	2006	300	15	1342	328	24.4	3348	628	18.8

* Max, maxillary; Mand, mandibular.

TABLE3. Percentage of pulp stones in the posterior teeth in the maxilla, mandible, and crown condition in the male group

Tooth	Location	Intact Teeth			Caries Teeth			Total		
		No.	With Stone	%	No.	With Stone	%	No.	With Stone	%
P	Max*	217	2	0.9	109	1	0.9	326	3	0.9
	Mand	348	10	2.9	30	0	0	378	10	2.6
P ₂	Max	253	6	2.4	135	1	0.7	388	7	1.8
	Mand	322	7	2.2	96	1	1.0	418	8	1.9
Mi	Max	103	88	85.4	301	115	38.2	404	203	50.2
	Mand	126	54	42.9	298	185	62	424	239	56.4
M ₂	Max	39	9	23.1	79	14	17.7	118	23	19.5
	Mand	230	35	15.2	194	41	21.1	424	76	17.9
Total	Max	612	105	17.2	624	131	21.0	1236	236	19.1
	Mand	1026	106	10.4	618	227	16.8	1644	333	20.3
Total	Max + mand	1638	211	12.9	1242	358	28.8	2880	569	19.8

* Max, maxillary; Mand, mandibular.

TABLE4. Sum of chi-square and probability values for the teeth evaluated

Tooth No.	χ^2	df	p
Mandibular			
P _i	3	1	0.05
P ₂	0.1	1	0.5
M ₁	4.3	1	0.05
M ₂	0.77	1	0.4
Maxillary			
P _i	2.6	1	0.09
P ₂	0.07	1	0.5
M ₁	52	1	0.0005
M ₂	0.005	1	0.5

the latter while in the paralleling technique a more standard picture can be obtained by having the central beam perpendicular to the long axis of the tooth. Moreover, radiographic films do not show all of the calcification in the pulp. A very small size denticle is not depicted on a radiographic film (7), since calcified bodies with a diameter smaller than 200 μ m cannot be seen in radiographs (5). The 19.2% pulp stone incidence was found in the coronal pulp chambers of the 12- to 13-yr-old group in this study. No similar study on the same age group was found in the English literature.

The frequency of occurrence of pulp stones in the male group was slightly higher than that in the female group, but the difference was not significant. This is in agreement with the finding of others (6, 8, 12). The prevalence of pulp stones in this study was found to be higher in the first molar (in both sexes) than in second molars and premolars; this finding also confirms the results of other investigators (11). The first molar is the first posterior permanent tooth to erupt and contains more pulp stones than others, thus confirming that calcification of the pulp increases with age (4, 11, 13, 15). Furthermore, as the first molar is the largest tooth in the arches, presenting a generous pulp chamber with a greater amount of pulp tissue and a better blood supply (1, 11, 16), it may contribute to conditions that precipitate calcification. Meanwhile, mandibular teeth was found to have significantly more pulp stones than maxillary teeth in both sexes. This could be related to our previous finding that mandibular molars erupt earlier than maxillary molars in the Iraq population (17).

Any irritation to the pulp caused by, for example, operative procedures, chronic irritants (caries, abrasion, erosion, periodontal disease, and traumatic response to orthodontic treatment) have been suggested to have a deleterious influence on the pulp (9, 12, 18). The pathological effect of irritation by

the microorganisms of dental caries on the pulpal tissue could produce a vascular wall injury, resulting in deposition of calcium salts within the tissue. Our investigation, however, does not show a definite association between caries and pulp stones, a fact confirmed elsewhere (6), since pulp calcification has been described in unerupted teeth.

Our study shows that in 12- to 13-yr-old males pulp stones were slightly more prone to develop than in the same age females. Likewise, they were found to occur more in mandibular than in maxillary teeth, with a higher prevalence in the first molar compared with other teeth (for both sexes). In general, slightly higher rates of stones were found in carious teeth compared with intact teeth, except for permanent first molars. This study does not show a positive relationship between pulp stone incidence and dental caries in the molars.

Dr. Baghdady and Dr. Ghose are assistant professors of pedodontics and Dr. Nahoom is an instructor in the Pedodontic Department, College of Dentistry, Baghdad University, Baghdad, Iraq.

References

1. Langeland IL, Rodrigues H, Dowden W. Periodontal disease, bacteria and pulpal histopathology. *Oral Surg* 1974;37:257-70.
2. Ten Cate AR. Oral histology, development, structure and function. St. Louis: CV Mosby, 1980:178.
3. Mjor IA, Pindborg JJ. Histology of the human tooth. Copenhagen: Munksgaard, 1973:61-2.
4. Orban. Oral histology and embryology. 5th ed. St. Louis: CV Mosby, 1962:157.
5. Moss-Salentijn L, Hendricks Klyvert M. Epithelially induced denticles in the pulps of recently erupted, noncarious human premolars. *J Endodon* 1983;9:554-60.
6. Shafer WG, Hine MK, Levy BM. A textbook of oral pathology. 4th ed. Philadelphia: WB Saunders, 1983:325.
7. Bhaskar SN. Synopsis of oral pathology. 7th ed. St. Louis: CV Mosby, 1986:161.
8. Hill TJ. Pathology of the dental pulp. *J Am Dent Assoc* 1934;21:820.
9. James VE, Schour L, Spence J. Biology of the pulp and its defense. *J Am Dent Assoc* 1959;5:903-11.
10. Stafne EC, Szabo SE. The significance of pulp modules. *Dent Cosmos* 1933;75:160-4.
11. Tamse A, Kaffe I, Littner M, Shani R. Statistical evaluation of radiologic survey of pulp stones. *J Endodon* 1982;8:455-8.
12. Sundell JR, Stanley HR, White CL. The relationship of coronal pulp stone formation to experimental operative procedures. *Oral Surg* 1968;25:579-82.
13. Sayegh FS, Reed AJ. Calcification in the dental pulp. *Oral Surg* 1968;25:873-82.
14. Osborne JW, Ten Cate AR. Advanced dental histology. 3rd ed. Bristol: John Wright and Sons, 1976; 157.
15. Hashim BY, Jasmah AB. H. Pulpal calcification in primary teeth: alight microscope study. *J Pedod* 1986, 254-64.
16. Wheeler. Dental anatomy physiology and occlusion. 4th ed. 1974:237.
17. Ghose LJ, Baghdady VS. Eruption time of permanent teeth in Iraqi school children. *Arch Oral Biol* 1981 ;26:13-5.
18. Delivanis HP, Sayer GJ. Incidence of coronal calcification in the orthodontic patient. *Am J Orthod* 1982;1:58-61.