

THE PREVALENCE OF PULP STONES IN BANGLADESHI ADULTS

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Summary

Pulp Stones (PS) are discrete calcified masses found in the dental pulp. The purposes of this study were to calculate the prevalence of pulp stones in Bangladeshi adult's undergone endodontic treatment and to report any observed associations between occurrence of pulp stones and sex, tooth type, dental arch, side and dental status. From 131 Bangladeshi adult patients, comprising 58 males and 73 females aged between 12-60 years, 148 teeth were examined under 2x magnifications on periapical radiographs pre-operatively, carefully removed roof of the pulp chamber, examined with magnified intraoral camera, and tried for orifices patency with narrow instrument. Directly observed stones, or any obstruction to negotiation to canal orifice, color change & any tactile sense of having stone like material in the pulp chamber treated as positive sign. Loose stones are then removed with curve probe like instruments; tight stones are loosen using narrow long fissure bur peripheral to stones. Pulp stones thus collected were scored as found or not found, and associations with sex, tooth type, dental arch, side and dental status noted. Pulp stones were found in 31 (23.66 percent) of the subjects and 31 (20.95 per cent) of the teeth treated. Occurrences were rare in premolars and cuspid (Almost zero percent) but significantly higher in molars (24.80 percent). If third molars were left out of analysis, pulp stones were more common in first molars than in second molars and in maxillary first molars than in mandibular first molars. Unrestored and intact molars displayed higher prevalence of pulp stones than carious and or restored molars.

This study result will provide the readers significant clues about the pulp stones during canal negotiation. Pulp stones may also provide useful forensic information when examining dental records to identify deceased persons.

Key words

Pulp tissue; Calcification; Dental arches; Dental status.

Introduction

Calcification can occur in the dental pulp as diffuse forms or as discrete calcified stones that may exist 'Freely' in pulp tissue or become 'Attached' to or 'Embedded' into dentine [1,2]. Pulp stones were histologically classified by Kronfeld into 'True' or 'False' forms, the former containing irregular dentine and the latter being degenerative pulp calcifications [1]. Other studies have noted problems with the above classification and new histological classifications have been proposed [2-4].

Two types of calcified bodies in dental pulp have been mentioned by Moss-Salentijn and Klyvert, pulp stones being compact degenerative masses of calcified tissues and denticles possessing a central cavity filled with epithelial remnants surrounded peripherally by odontoblasts [4]. Etiological factors for pulp stone formation are not well understood, although, some factors that have been implicated in stone formation include pulp degeneration, inductive interactions between epithelium and pulp tissue, age, circulatory disturbances in pulp, orthodontic tooth movement, idiopathic factors and genetic predisposition [4-9]. The formation of pulp stones has also been associated with long-standing irritants such as caries, deep fillings and chronic inflammation [1]. Recent literature still suggests that pulp stones are a feature of an irritated pulp, attempting to repair itself [10].

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Pulp stones have been noted to vary in number from one to 12 or more in a single tooth, their size varying from minute particles to large masses occluding the pulp cavity [2]. They have been reported to occur more often in coronal pulp although they are also found in radicular pulp [2-3].

The prevalence of pulp stones in teeth, based on radiographic examinations, has been reported to be around 20% to 25% while histological examinations yield higher prevalence [4,5,11-13]. Recently, Hamasha and Darwazeh identified pulp stones in 51.4% of Jordanian adults in a radiographic study [11].

The aims of this study were: to calculate the prevalence of pulp stones in Bangladeshi adults on direct observation during endodontic treatment; to explore possible associations between pulp stones and sex, tooth type, dental arch, side and dental status; and to compare the results with published data.

Materials and methods

The study sample included 148 teeth undergone for endodontic treatment of 131 Bangladeshi adults comprising 58 (44.27 per cent) males and 73 (55.73 per cent) females aged between 12-60 years. The sample and subjects had been obtained conveniently as part of endodontic treatment during a six months period (10th April 2012 to 10th October 2012) including all types of teeth in a private center (Dr. Kamal Research Center, DKRC). Teeth were examined under 2x magnifications on periapical radiographs pre-operatively, carefully removed roof of the pulp chamber, examined with magnified intraoral camera and tried for orifices patency with

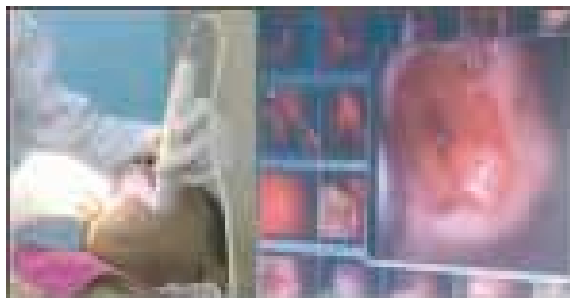


Fig 1 : Pulp chamber is magnified with intra-oral camera for stone to visualize on the laptop monitor



Fig 2 : A large stone occluding the pulp chamber and making difficulty in negotiating the canal

narrow instrument (Fig 1,2). Directly observed stones, or any obstruction to negotiation to canal orifice, color change & any tactile sense of having stone like material in the pulp chamber treated as positive sign. Loose stones are then removed with curve probe like instruments; tight stones are loosen using narrow long fissure bur peripheral to stones. Pulp stones thus collected were scored as present or absent, and associations with sex, tooth type, dental arch, side and dental status noted.

Pulp stones were identified as definite hard masses inside the pulp chambers of the first and second premolars, and first and second molars per-operatively and some stones are identified also pre-operatively on radiograph. They were scored as found or not found, and the status of each tooth categorization as: i) unrestored and intact ii) restored and intact iii) unrestored and carious or iv) restored and carious, the extent and size of restorations or caries, and the configuration of pulp stones, such as number, size and location in the pulp chamber were not detailed.

The data were analyzed by Statistical Package for Social Sciences (SPSS) 17 and Chi-square analyses were used to compare the frequencies of occurrence of pulp stones between sexes, tooth types, dental arches, sides and dental status. Statistical significance for the analyses of the results was set at the 5% probability level.

Results

Prevalence of pulp stones and distribution between sexes

Pulp stones were found in 31 (23.66%) subjects, which included 11 (18.96%) of 58 males and 20 (27.40%) of 73 females. The overall difference in distribution between the sexes was not statistically significant ($p>0.05$). In the teeth level overall occurrence of pulp stones in females (24.10% of 83 teeth) were greater than that in males (16.92% of 65 teeth). As there were no significant difference in pulp stones occurrence between sexes data were then pooled for arch, sides and condition, and are presented in Table I .

Pulp stones and tooth types

Pulp stones were observed in 31 (20.95%) of the 148 teeth treated (Table I). No pulp stones were found in cuspid and premolars of 23 teeth and found in 31 (24.80%) of the 125 molars, with the differences in occurrences being statistically significant ($p<0.05$). Given the low frequency of occurrence of pulp stones observed in cuspid and premolar teeth, further analyses were carried out for molar teeth only. The frequencies of pulp stones were higher in first molars than in second molars in each dental arch and when data for both arches were combined (26.07% vs. 22.92%).

Table I : Frequency of pulp stones in endodontically treated teeth of 131 adult Bangladeshi aged 12-60 years

Tooth type	Maxilla		Mandible		Sum	
	No of Teeth		No of Teeth		No of Teeth	
	Total	With PS	Total	With PS	Total	With PS
	N	n%	N	n%	N	n%
C	2	0 (0%)	1	0 (0%)	3	0 (0%)
P1	10	0 (0%)	0	0 (0%)	10	0 (0%)
P2	8	0 (0%)	2	0 (0%)	10	0 (0%)
Sum P	18	0 (0%)	2	0 (0%)	20	0 (0%)
M1	19	6 (31.58%)	50	12 (24.00%)	69	18 (26.07%)
M2	21	6 (28.57%)	27	5 (18.52%)	48	11 (22.92%)
M3	2	0 (0%)	6	2 (33.33%)	8	2 (25.00%)
Sum M	42	12 (28.57%)	83	19 (22.89%)	125	31 (24.80%)
Total	62	12 (19.35%)	86	19 (22.09%)	148	31 (20.95%)

C=Cuspid, P=Premolar, M=Molar, Ps=Pulp stones

Pulp stone occurrence among dental arches and sides

Total occurrence of pulp stones were higher in maxillary molars (28.57%) than in mandibular molars (22.89%), but the difference is not statistically significant ($p>0.05$) (Table). Both first and second maxillary molars showed bilateral similar distribution (50%) whereas first mandibular molar shows right side predilection (67%) compared to second mandibular molar (40%) (TableII).

Table II : Prevalence of pulp stones on left and right molar teeth

Tooth type	No of teeth without PS on both sides n%	No of teeth with PS on		
		Left side n%	Right side n%	Both sides n%
Maxilla				
M1	13 (68.42%)	3 (50.00%)	3 (50.00%)	6 (31.58%)
M2	15 (71.43%)	3 (50.00%)	3 (50.00%)	6 (28.57%)
Mandible				
M1	38 (76.00%)	4 (33.00%)	8 (67.00%)	12 (24.00%)
M2	22 (81.50%)	3 (60.00%)	2 (40.00%)	5 (18.50%)

Pulp stones and dental status

Given that five (4%) of the 125 molars examined were unrestored and intact (category i) data for categories ii, iii and iv were combined to reflect the sum of factors that could cause pulp irritation, and they are presented in Table III. When compared with restored and or carious molars, significantly higher occurrences of pulp stones were noted in unrestored and/or intact molars (80% vs. 22.5% respectively) ($p<0.05$).

Table III : Prevalence of pulp stones in molar teeth with different dental status

Tooth type	Total	Unrestored & intact Sum	Dental status		
			No of teeth with PS	Restored and/or carious Sum	No of teeth with PS
Maxillary Right	25	1	1 (100.00%)	24	5 (20.83%)
Maxillary Left	17	2	1 (50.00%)	15	5 (33.33%)
Mandibular right	34	1	1 (100.00%)	33	11 (33.33%)
Mandibular left	49	1	1 (100.00%)	48	6 (12.5%)
Sum	125	5	4 (80.00%)	120	27 (22.5%)

Discussion

Direct examinations are not likely to detect pulp stones perhaps less than 500µm in diameter or those are small enough and not obscuring the patency of canal orifice. But in comparison with radiographic and histological evaluation, direct method is the only means of evaluating pulp stones with live experience like stone's size, number, location and problems they create. Scoring difficulties in this study were encountered when pulp stones were very small.

In this study, the size of pulp stones ranged from small particles to calcified bodies of large diameter that occluded most of the pulp chamber and more than one pulp stone was identified in a single tooth on a few occasions, but quantitative measurements were not undertaken. The prevalence of pulp stones recorded in the subjects of this study was lower than that reported recently in a Jordanian population on radiograph [11].

In the present study, women presented a higher prevalence of pulp stones than men. Though this difference was not statistically significant ($p > 0.05$) but is consistent with other studies previously reported.[16] However, according to another studies, significant difference were observed between genders[13]. In the literature, bruxism which causes longstanding irritation on the dentition was thought to be the reason of this difference because it is more prevalent in women. The trend for a higher occurrence of pulp stones in first molars than in second molars is also in agreement with most previous investigations [13,14]. Higher frequencies of pulp stones were noted in maxillary molars in this study. But similar frequencies in both the arches or higher occurrences in mandibular teeth have also been reported [3,4,13,14].

A significant association between pulp stone occurrences in carious and/or restored teeth was not noted in this study to suggest that chronic pulp irritation might lead to pulp stone formation. A higher occurrence of pulp calcification has been noted in carious, unrestored teeth than in restored teeth, presumably because the pulps have some degree of chronic inflammation due to the caries and restorations [3,15]. However, some studies have failed to find any significant association between pulp stone occurrence and the presence of caries or restorations [12].

Protective pulpal responses to irritation, such as secondary dentine formation resulting in a decrease in the size of pulp chamber, and degenerative diffuse calcification might result in reduced ability to detect pulp stones in these teeth during endodontic treatment. The presence of pulp stones reported in very young teeth and developing tooth germs indicates that pulpal pathology is unlikely to be the only aetiological factor for pulp stone formation [1].

The currently held clinical view is that pulp stones have no significance other than possibly causing difficulties during endodontic therapy, such as hindering canal location and negotiation [10]. In forensic dentistry, radiographic matching of pulp stone configurations, along with other features recorded in dental records, may provide valuable information in the identification of deceased persons.

The limitations in this study included the method and number of sample selection, which included only a limited number of population. A larger sample size would enable a more detailed assessment of the relationship between pulp stone formation, caries and restorations. Detailed configurations of pulp stones were also not noted, nor were other factors that may cause pulpal irritation, such as tooth wear or periodontal conditions.

Further research is indicated to elucidate the aetiological factors involved in pulp stone formation. The use of pulp stones in forensic odontology might be enhanced if a relationship between age and pulp stone formation could be confirmed by longitudinal studies.

Conclusion

The features of pulp stones noted in this study may provide additional information about the dental morphological features of Bangladeshi people and may raise the opportunity to work in a wider range in this field.

Disclosure

Both the authors declared no competing interest.

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