

Radiographic Assessment of Occurrence of Pulp Stones in Molars of Selected Adult Nepalese Populations at Tertiary Care Center

Acharya N,¹ Chakradhar A,² Kafle D³

¹Department of Conservative Dentistry and Endodontics, Institute of Medicine, Maharajgunj Medical Campus, Dental Teaching Hospital, Maharajgunj, Kathmandu, Nepal.

²Department of Conservative Dentistry and Endodontics,

³Department of Orthodontics, Dhulikhel Hospital, Kathmandu University Hospital, Kathmandu University School of Medical Sciences, Dhulikhel, Kavre, Nepal.

Corresponding Author

Nisha Acharya
Department of Conservative Dentistry and Endodontics,
Institute of Medicine, Maharajgunj Medical Campus,
Dental Teaching Hospital,
Maharajgunj, Kathmandu, Nepal.
E-mail: nishaacharya@iom.edu.np

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ABSTRACT

Background

Pulp stones or “denticles” are a frequent finding in coronal and radicular pulp of primary and permanent dentition. These discrete calcified bodies can be seen in a healthy, diseased and sometimes even in an unerupted tooth. These calcifications are mostly present in molars as free, attached or embedded to dentine of pulp chamber or root canals.

Objective

To determine the occurrence of pulp stones in molars of selected adult Nepalese population using radiographs and assess the association of its occurrence gender and arch wise.

Method

A descriptive cross-sectional study was performed using orthopantomogram of total 380 patients (190 male and 190 females) of age group ranging from 16-30 years by convenience sampling. Data were collected through the examination of both hard and soft copies of radiographs under magnification. Pulp stones were scored as present or absent and their association with gender and dental arch were recorded. Descriptive statistics and chi square test was performed to see the prevalence and to compare the occurrence of pulp stone respectively.

Result

Out of 380 radiographic samples, pulp stones were present in 41.05% of the samples. The occurrence of pulp stones were found to be higher in females than in males, although the difference was not statistically significant ($p=0.060$). The total number of teeth with pulp stones was 238 and 61 in maxillary and mandibular arches respectively, with statistically significant difference ($p<0.001$).

Conclusion

The overall occurrence of pulp stone was found to be 41.05%. It was observed more in females (45.78%) than in males (37%) and more frequently located in maxillary molars (29.2%) than in mandibular molars (8.2%).

KEY WORDS

Denticles, Molars, Nepalese population, Prevalence, Pulp stones

INTRODUCTION

Pulp stones or denticles are discrete calcified aggregates occurring most frequently in dental pulp either in the chamber or canals of mostly molar teeth. Its frequency appeared to increase with age however it is found in healthy, diseased and sometimes in an unerupted teeth.¹ Usually detected during routine radiographic examination, these radiopaque masses of variable sizes are more frequently seen in coronal than in radicular pulp.² These calcifications can occur freely in the pulpal tissue or is attached to or embedded in the dentinal surface of the pulp chamber.³

The prevalence of pulp stones, based on radiographic examination vary from 8-90% with higher values reported in histological evaluation.⁴ This wide range of occurrence of pulpal stones is due to the different study types, designs and radiographic techniques employed. Pulp stones are usually symptomless; however if it impinges on the blood vessels or nerves, it can cause mild to severe pain and sometimes the pain of idiopathic origin.⁵ These calcifications can obstruct the pulpal chambers and root canals leading to difficulty and failure of endodontic treatment.⁶ Moreover, calcification of dental pulp and calcific atheromas share similar pathogenesis. Hence, routine dental radiographs may be useful method for screening potential cardiovascular diseases.⁷

However, our literature is deplete on the prevalence of dental stone and its correlation with demographic factors in our population. Hence, the present study aims to calculate the prevalence of pulp stones using radiographic technique in selected adult Nepalese population. This study also aims to evaluate possible association of pulp stones with gender and dental arch.

METHODS

In this descriptive cross-sectional study, 380 records of the patients including their orthopantomogram (OPG) were selected from January 2018 to January 2019, from Department of Oral Medicine and Radiology by convenient sampling method. Out of 380 samples 190 (50%) were male and 190 (50%) were females. The mean age group was 23 years ranging from 16 to 30 years. OPG of maxillary and mandibular permanent molars (excluding third molars) were studied. Data were collected through the examination of both hard and soft copies of radiographs under magnification by two experienced clinicians. A clear radiopaque mass in the pulp chamber was diagnosed as a pulp stone. Pulp stones were scored as present or absent and its association with gender and dental arch were also recorded. However, the size, shape and number of denticles were not evaluated. Ethical clearance was received from Institutional Review Committee of Kathmandu University School of Medical Sciences (Protocol approval number is:

05/18). All the patients undergoing radiographs were pre informed that their records could be used for study Records of the patients, with significant medical history such as hypertension, diabetes, cardiac diseases, renal diseases, respiratory disorders, calcific atheroma, genetic disorders, etc., with age less than 16 and more than 30 (16 and 30 age group were included), radiographs with poor quality, radiographs with missing, carious, grossly decayed, root canal treated or restored first and second molars, in any of the arches were excluded. The final samples consisted of 380 records and radiographs that were of adequate quality to allow the determination of presence and absence of pulp stones in molars of both arches.

All the data obtained from radiographic examination were recorded in Microsoft Excel and coded for analysis. Statistical analysis was performed using SPSS software version 16 (IBM Corporation, USA). Kolmogorov-Smirnov test was done to test the normality of the data and was found to be normally distributed. Descriptive statistics was used to see the prevalence whereas Chi square test was done to compare the occurrence of pulp stone among male and female and maxillary and mandibular arches. Confidence interval was set at $p < 0.05$ to see the statistical significance of the results.

RESULTS

Out of 380 radiographic samples, the prevalence of pulp stones were found to be 41.05% (156 patients). The pulp stones were detected in 45.78% (87) of female and 37% (69) of male patients. This showed that occurrence of pulp stones is higher in females than in male, although the difference was not statistically significant ($p=0.060$, Table 1).

Table 1. Distribution of pulp stones in male and female patients

Gender	Pulp stone				Confidence Interval	p value
	Present	Absent	Total	Percentage		
				Present	0.05	0.060
				Absent		
Male	69	121	190			
Female	87	103	190	41.05	58.94	
Total	156	224	380			

Gender wise distribution of occurrence of pulp stones in maxillary and mandibular molars among male and female patients is shown in Table 2 and Table 3 respectively. Arch wise and tooth wise distribution of occurrence of pulp stones in molars showed statistically significant difference ($p < 0.001$) with prevalence being more in maxillary arch (Table 4).

Table 2. Gender wise distribution of pulp stones in maxillary molars. (n=380)

Gender	Tooth #16			Tooth #17			Tooth #26			Tooth #27		
	Present	Absent	p	Present	Absent	p	Present	Absent	p	Present	Absent	p
Male	26	164	0.017	19	171	0.063	24	166	0.12	26	164	0.238
Female	45	145		30	160		36	154		32	158	
Total	71	309		49	331		60	320		58	322	

Table 3. Gender wise distribution of pulp stones in mandibular molars. (n=380)

Gender	Tooth #36			Tooth #37			Tooth #46			Tooth #47		
	Present	Absent	p	Present	Absent	p	Present	Absent	p	Present	Absent	p
Male	13	177	0.517	2	188	0.142	11	179	0.98	4	186	0.500
Female	10	180		6	184		12	178		3	187	
Total	23	357		8	372		23	357		7	373	

Table 4. Arch wise and tooth wise distribution of pulp stones in molars.

Arch	Frequency of pulp stones						P value
	Number of patients		Number of teeth/ percentage				
Maxilla	111 (29.2%)	16	17	26	27	Present	Absent
		71(4.6%)	49(3.3%)	60(3.9%)	58(3.8%)	238(15.6%)	1282 (84.5%)
Mandible	31 (8.2%)	36	37	46	47	Present	Absent
		23 (1.5%)	8(.52%)	23(1.5%)	7(.46%)	61 (4.01%)	1459 (95.98%)
Both	14 (3.7%)					299 (9.84%)	2741 (90.16%)
Total	156 (41.1%)						

DISCUSSION

Denticles are hard bone like calcification that are often detected on radiographic examination as radiopaque mass. These calcification occurs either in the pulp chamber or root canals as an incidental findings that needs no treatment unless symptoms appear. Structurally, pulp stones can be true, false and irregular diffuse amorphous type that usually occurs in close association with blood vessels. True pulp stones consist of dentin lined by odontoblasts, whereas false stones are mineralized degenerating pulpal cells.⁸ They are round to oval and sometimes can be as big as 2-3 mm in diameter.² Microscopically, pulp stones will be apparent in nearly all the teeth of the people older than fifty years and half the teeth of the younger peoples.⁹

Although the etiology of pulp stones formation is not fully understood, some factors have been implicated in the pulpal calcification such as age, orthodontic tooth movement, pulpal circulatory disturbances, pulpal degeneration, inductive interactions between epithelium and pulp, genetic predisposition, chronic inflammation of the pulp, long standing irritation of the pulp due to caries and deep restoration and idiopathic factors.¹⁰ The formation of pulp stones has also been associated with anomalies like dentinogenesis imperfecta, dentinal dysplasia, Van der woude syndrome, Marfan Syndrome, nanobacteria, fluoride supplementation, and trauma.¹⁰⁻¹⁴ It has also been suggested that the pulpal calcification is a repair attempt of an irritated pulp.¹⁵

Literatures provide studies on pulp stones based on histological and radiographic methods using either bitewing or periapical radiographs.^{1,3,6,7,16,17} Some studies stated that bitewing and periapical radiographic techniques did not show the differences in the diagnosis of pulp stones sufficiently.^{17,18} Panoramic radiograph (OPG) can be good substitute for the screening of all the teeth in all arches in a single frame for pulp stones.² In this study, we choose OPG radiographs for the examination of the occurrence of pulp stones in molars in both arches as it was a convenient method to view all eight molars from a single radiograph.

In the present study, the prevalence of pulp stones is reported based on both the number of patients and teeth. On the basis of the number of patients pulp stones were detected in 41.1% (156) and absent in 58.9% (224) of patients. Similarly on the basis of teeth 9.84% of teeth (299 out of 3040) examined had pulp stones. Sisman et al. found pulp stones in 57.6% of the subjects and 15% of the teeth examined in a Turkish population.¹ Al-Ghurabi et al. detected pulp stones in 34.8% of the patients and 7.3% of teeth examined.² Moreover, Ranjitker et al. found pulp stones in 333 (10.1%) teeth out of 3296 teeth examined.³ Most of the prevalence study of pulp stones are based on radiographic technique. However, pulp stones smaller than 200 µm is diameter is not detected in radiographs. Hence, the true prevalence is likely to be higher than the reported data.

According to gender, the prevalence of pulp stones in this study was found to be higher in females (87 patients, 174 teeth) than that of males (69 patients, 125 teeth). However, the difference was not statistically significant ($p=0.06$). This is in accordance to the study by Al-Ghurabi et al.² They found 75 females (143 teeth) and 61 males (133 teeth) with pulp stones but with no significant difference. Similarly, in a study done by Sisman et al. the occurrence of pulp stones were more frequent in females than in males with significant difference.¹ This might be due to long standing irritation on dentition due to bruxism which is more common in females than in males.¹⁶ However, in contrast to our study, Gaddalay et al found the prevalence rate of pulp stone to be higher in males than in females.¹⁹ Moreover, some studies show no significant difference between two sexes.^{3,20} These inconsistent findings can be explained by the significant differences in the sample sizes, methodology, ethnicity and age of the population studied.

A very high prevalence rate of pulp stones were recorded in molars (45.2% for males and 65.9% for females) than in premolars (6.1% for males and 5.8% for females) in a study done by Goga et al.⁸ Similarly, Sener et al. and Shohreh et al. also found significantly higher prevalence of pulp stone in molars.^{16,21} That was the reason, in this study we included only molars. In the present study, 29.2% of the patients had pulp stones in maxillary arch, 8.2% had pulp stones in mandibular arch and 3.7% in both arches. Thus the occurrence of pulp stones was found to be more frequent in maxilla than in mandible in each tooth type and location. This finding is in consistent with the findings of other researchers.^{1,3,17}

This study has clinical significance in endodontics as it can cause hindrance during canal location and negotiation during root canal therapy.²² In forensic dentistry also pulp stone can provide valuable information for the identification of deceased person by radiographic matching of other dental records along with the pulp stone configuration.³ Moreover, pulp stones may have clinical significance in the early detection of calcific atheromas.⁷

This study did not evaluate the size, shape and number of denticles, which also might have clinical significance in terms of early detection of calcific atheromas. Besides due to small sample size and narrow age range, the occurrence figures of pulp stones in this study might not represent the whole Nepalese adult population. Hence, further studies are recommended which can also include the relation of pulp stones along with its variables with calcific atheromas.

CONCLUSION

The occurrence of pulp stones in this study was found to be more in females than in males and significantly higher in maxillary than in mandibular arch. Furthermore, the occurrence seems to be independent of age and lesions, as it was also detected in young patients without any dental etiology. Hence, for the implication of pulpal calcification in endodontic treatment, forensic odontology and early identification of calcific atheromas large scale longitudinal studies are suggested.

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