Original Research Article

Correlation between pulp stones and serum calcium levels: a preliminary study

Ashutosh Harsh[1],Pragya Harsh[2*],Divya Kumar Jain[3], Ramniwas Kumawat[4], Sharad Purohit[5], Mansoor Saify[6]

[1]Associate Professor, SRG Medical College and Hospital, Jhalawar, Rajasthan, India
[2]Ex-SR, S.N. Medical College and Hospital, Jodhpur, Rajasthan, India
[3]Assistant Professor, Department of Dentistry, SRG Medical College and Hospital, Jhalawar,Rajasthan, India
[4]Assistant Professor, Government Medical College and Hospital, Pali, Rajasthan, India
[5]Ex-Reader, Jodhpur Dental College and Hospital, Jodhpur, Rajasthan, India
[6]Senior Resident,Department of Dentistry, SRG Medical College and Hospital,Jhalawar,Rajasthan, India

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Abstract

Objective: To find the correlation between pulp stones and serum calcium levelsMaterials and methods: Intraoral periapical radiographs of 698 patients were retrospectively analyzed in the present study. The pulp stones were identified as the presence of a definite round or oval opaque or dense structures in the pulp space. Serum calcium levels were determinedby chemistry auto-analyzer.Statistical analysis was carried out by applying Chi-square tests with the Yates correction andPearsons Coefficient.**Results:** Out of a total of 698 individuals, pulp stones were identified in 242 (34.6%) of patients. In 376 males, 129 (34.3%) were having pulp stones and among 322 females, 113 (35 %) were having pulp stones. The association between gender (Chi-square= 0.2468, P= 0.6958), age group (Chi-square= 0.1986, P= 0.6732) and presence of pulp stones was not found to be statistically significant. No significant correlation was found between serum calcium levels and presence of pulp stones.**Conclusions**: The study did not report any significant association between occurrence pulp stones and serum calcium levels.

Keywords: Pulp stones, pulp calcification, serum calcium

Introduction

The calcified structures in the dental pulps of healthy, diseased and even unerupted teeth are known as pulp stones and may be found deciduous and permanent teeth[1]. These calcifications may be seen in the coronal or radicular pulp. Pulp stones have been represented as the symptoms of the changes in the pulpal tissues rather than their etiology. The precise mechanism and the etiology of formation of pulp stones is not established, however, factors such as degeneration of pulpal tissues, increasing age, genetic factors, certain syndromes, epithelium rests in the pulp tissue, discrepancy in thevascular supply, periodontal pathologies, orthodontic therapy, iatrogenic factors and chronic irritants such as caries, large restorations, or abrasion have been proposed[2,3]. It has also observed that failure of irritated pulp to repair itself may lead to formation of pulp stones. The carious teeth of children and young adults have shown a 5 times higher incidence of pulp calcifications when compared with the non-carious teeth[2]. The frequency of pulp stones has been reported to increase with advancing age[4].Apart from erupted teeth, pulp stones have been also observed in the impacted teeth in a recent study[5].The number of pulp stones may vary from 1 to 12 or more in an individual tooth and the dimensionsmay range from microscopic to masses of larger sizes occluding the pulp space[6].Calcifications in the pulp are known to occur throughout the dentition in patients with systemic or genetic diseases like dentinal dysplasia and dentinogenesis imperfect[7].Previous studies have proposed pulp stones to be a manifestation of various systemic diseases leading to pathological biomineralization in multiple structures of the body[8,9].Various conditions like hypercalcaemia, gout, and urolithiasisthat are noted secondary to the calcium metabolism have been observed as the pre-disposing factors for the formation of pulp stones[10].To the best of our knowledge, no previous studies have been done to establish a correlation between the presence of pulp stones and serum calcium levels, hence present study has been carried out to know the correlation between pulp stones and serum calcium levels.

**Correspondence*
Dr. Pragya Harsh
Ex-SR, S.N. Medical College and Hospital, Jodhpur, Rajasthan, India
E-mail: ashutoshharsh2007@gmail.com

Material and methods

The present study was carried out after obtaining ethical clearance from the Institutional Review Board. The study objectives were explained to the patients and consent was obtained from them. All the radiographs were taken for various complains and treatment needs of the patients. A total of 698 radiographs of 376 male and 322 female participants, aged 18 years and above, with a mean age 50.6 ± 10.24 years were incorporated in the study sample. The teeth which have undergone root canal therapy and with resorbed roots were excluded from the study. Tooth with caries, restoration, attrition, and periodontal disease were also excluded. Radiographs of patients with systemic illness,patients taking calcium or vitamin D supplements, patients with dentine dysplasia, dentinogenesis imperfect, and Van der Woude syndrome were not examined in this study.The radiographs were interpreted by two qualified and experienced oral and maxillofacial radiologist. In order to check the intraobserver variations, the same examiners repeated the interpretations after two weeks. The pulp stones were identified as the presence of a definite round or oval opaque or dense mass in

the pulp cavity. Venous blood was collected from the patient in plain vacutainers and serum was immediately separated by centrifugation. Serum calcium was measured by chemistry auto-analyzer.

Data analysis

Analysis of the data was done using SPSS software (Version 21.0) by applying Chi-square tests with the Yates correction. The reliability of measurements was evaluated by kappa statistics. Correlations were studied using Pearsons Coefficient. A p value of <0.05 was considered as statistically significant.

Results

The reliability was very good, with Kappa values of 0.91 for intraoperator agreement and of 0.86 for interoperator agreement. Out of a total of 698 individuals, pulp stones were identified in 242 (34.6%) of patients. In 376 males, 129 (34.3%) were having pulp stones and among 322 females, 113 (35 %) were having pulp stones. The association between sex and status of pulp stones was not found to be statistically significant (Chi-square= 0.2468, P= 0.6958). A maximum of 38.5% of individuals were aged 59 and above a minimum of 30.1% of individuals belonging to 19-28 years of age group were identified with pulp stones. The association between the age groups and occurrence of pulp stone was not found to be statistically significant (Chi-square= 0.1986, P= 0.6732) (Table 1). No significant correlation was found between serum calcium levels and presence of pulp stones (Table 2).

Table 1: Distribution and Comparison of the presence of pulp stones according to age group and gender

Age groups (years)	Total patients	Females with pulp stones	Total patients	Male with pulp stones
19-28	72	22 (30.5%)	92	29 (31.5%)
29-38	68	23 (33.8%)	81	28 (34.5%)
39-48	62	22 (35.4%)	74	24 (32.4%)
49-58	59	22 (37.2 %)	63	23 (36.5%)
59 and above	61	24 (39.3%)	66	25 (37.8%)
Versus age: Chi-square= 0.1986, P= 0.6732 (NS)				
Versus gender: Chi Square= 0.2468, P= 0.6958 (NS)				

NS: Non-significant

Table 2: Correlation of presence of pulp stones according with serum calcium levels

Age groups (years)	Total patients	Females with pulp stones	Total patients	Male with pulp stones	Serum calcium (mg/dl)	r value	P value
19-28	72	22 (30.5%)	92	29 (31.5%)	10.7±0.29	0.063	0.82 (NS)
29-38	68	23 (33.8%)	81	28 (34.5%)	10.2±0.32	0.077	0.74 (NS)
39-48	62	22 (35.4%)	74	24 (32.4%)	9.93±0.20	0.051	0.68 (NS)
49-58	59	22 (37.2 %)	63	23 (36.5%)	9.24±0.24	0.067	0.85 (NS)
59 and above	61	24 (39.3%)	66	25 (37.8%)	9.06±0.18	0.046	0.61 (NS)

NS: Non-significant

Discussion

Pulp stones are discrete calcifications which are found in the pulpchamber or pulp canals. Pulp stones may occur freely within the pulp tissue or embedded and adherent to the dentin. The embedded pulp stones formed in the pulp space may become enclosed within the canal walls due to the continuous physiological dentinal deposition. The apical portion of the root is observed as one of the common location for the occurrence of pulp stones[8,9].Studies in the literature reported the prevalence of pulp stones varying from 8% to 90%, depending on the type of the study design, and technique employed. The prevalence rate was different among various populations, from different geographic locations and from different races and ethinicities[10-14].No previous studies have carried out till date to study the correlation between the presence of pulp stones and serum calcium levels. Hence this study was carried out to find if any such relation is present. Calcifications in the pulp space are not evident clinically, theyare observed on variousradiographic views such as bitewing and periapical radiographs and panoramic radiographs as radiodense masses within the pulp chamber and root canal[15]. Pulp stones are known to be visualized on radiographs only when the dimension of the stones exceeds 200 µm.The intraoral radiographic views are easy and noninvasivediagnosticmodalities that routinely reveal the presence of calcified structures in the coronal or radicular pulp.The intraoral periapical and bitewing radiographs when compared for their efficacy in the diagnosis of the pulp calcification showed no significant difference, hence intraoral periapical radiographs were considered to identify the presence of pulp stones in this study[16-18]In the present study, pulp stones were observed in 34.6% of patients which does not match with the results of the previous studies. da Silva et al. detected pulp stones in 31.9% of patients which was less when compared to the results our study, whereas a higher prevalence was observed by Rodrigues et al.[19]who noticed 55% of patients as having pulp stones. Both these studies observed pulp stones on CBCT images in Brazilian population. Hamasha and Darwazeh noted a prevalence in 51% of the Jordanian individuals[20] and Patil et al., observed a prevalence of 50.93% in a Saudi Arabian population, these rates were high when compared with that of the present study. Some studies in the literature report a significant difference among gender with respect to the presence of pulp stones[21] where as in our study we did not find any significant difference among genders this was in accordance with Kannan et al [22],Ranjitkar et al[23], and Sisman et al[24].In the present study we did not observe any correlation between age and occurrence of pup stones and this was similar with findings of Hamasha and Darwazeh[20] and Turkal et al[25] Whereas some of the studies in the literature reported difference in prevalence of pulp stones in different age groups[19-22]. Even though calcium metabolism have been proposed as the pre-disposing factors for the formation of pulp stones,[10] no correlation was observed between the presence of pulp stones and serum calcium levels in the present study.

Conclusion

The study, however, did not report any significant association between occurrence pulp stones and serum calcium levels but it seems to be of compelling clinical attention. Further large-scale, multi-institutional studies using different methods and in different populations are need to be carried out to authorize any positive correlation between pulp stones and serum calcium levels

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