

Original article**Radiographic Assessment of the Prevalence of Pulp Stones
in Iranian Population**

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Abstract:

Introduction: Pulp stones are separate calcified mass that we can observe in the dental pulp. The present study is conducted to evaluate the Incidence and Distribution of Pulp Stones Found in Radiographic Examination of Dental Patients in Sari.

Methods: In total, 493 panoramic radiographs from patients attending the dental clinics of at Mazandaran University of Medical Science, from January 2017 to April 2018 were examined. The sample composed of 164 male and 329 female with age range of 10-60 years. About 3235 teeth were evaluated. Associations of pulp stones with different tooth types, sex, upper or lower arc and the side were noted.

Findings: The overall prevalence of pulp stones in the present population was found 15.21%. Females constituted 73.33% and males constituted 26.67%. No significant gender difference with the occurrence of pulp stones was observed. 37.14% was the incidence of pulp stones in left maxillary first molar which was considered to be the highest frequency compared to all other teeth.

Conclusion: In conclusion, maxillary first molars had maximum number of pulp stones and patients in the age group from 20-30 years had more pulp stones than the others. All this information could be of help during endodontic procedures

Keywords: Panoramic radiographs, Prevalence, Pulp stones, Iranian population

Introduction:

Pulp stones are calcified mass in the pulp of tooth. Calcification can occur in the dental pulp as separate calcified stones or as diffuse form that can occur either in the pulp tissue or attached to dentin. (1) They are usually detected during radiographic examination as radiopaque areas of variable sizes and shapes. (2) Structurally, pulp stones are classified as true that are made of

normal tubular dentine and lined by odontoblasts and as false, wherein pulp stones are formed from degenerating pulp cells that become mineralized. A third type, amorphous' pulp stones, has more irregular shape compared to the false type. (2,3).The etiology of pulp calcification is unknown. However, some factors like genetic predisposition have played a role in forming stone (4),

Orthodontic tooth movement, dentine dysplasia, dentinogenesis imperfect and in certain syndromes such as Vandrroude syndrome (5), nanobacteria (6), circulatory disturbance in pulp, age (7), fluoride supplementation (8), interactions between the epithelium and pulp tissue, idiopathic factors (9), Marfan syndrome (10) and long-standing irritants like caries, deep restorations, and chronic inflammation. (11) Pulp stones are diagnosed by X-ray imaging and histological slides. Radiographic appearance of pulp stones is radiopaque masses, which is differ in size from several millimeters to filling the whole chamber or root canal. (1, 3, 12)

One of the common symptoms of pulp stones is pain, which can vary from mild to severe. (6, 11)

It has been reported that the incidence of pulp stones increase with age. (13, 14) Some studies did not discover any difference in occurrence between males and females (1, 11, 14, 15), whereas other studies have found females to have more pulp stones than males. (16, 17)

Since the prevalence of pulp stones varied in different populations, this study was carried out to assess the frequency of pulp stone and to evaluate possible associations between pulp stones and gender, tooth type, and side in Sari population, Mazandaran, Iran.

Methods:

In this retrospective cross-sectional study, 493 dental records were selected from the records of patients who attended the dental clinics at Mazandaran University of Medical Sciences, Mazandaran, Iran, for routine dental treatment. These records were registered between January 2017 to April 2018. The digital panoramic radiographs were examined by an expert

endodontist and a dental student simultaneously after put the radiograph on a viewer; Only high quality Images which had not any superimposition were checked. About 3235 teeth were evaluated; teeth with crowns or bridges that prevented adequate vision of the pulp chamber were not included in the study sample.

The sample composed of 164 male and 329 female with the age range of 10-60 years. Information about name, age and gender had been recorded for each patient.

Intra-pulpal dense radio-opaque structures seen in the panoramic radiographs were considered as pulp stones and were scored as present or absent, number of stone and associations with, gender, dental arch and tooth type were recorded. Score of present was given only after the confirmation of two examiners.

Findings:

A total of 493 patients, 329 females (66.73%) and 164 males (33.27%) with 3235 teeth was evaluated in the present study, and according to Chi-square test there were no significant difference between the number of males and females (Chi-square=55.223, df=1, P-value<0.001).

The age range of the subjects was 10-60 years, pulp stones were observed in 75 patients (15.21%) and 5.37% teeth; 55 females and 20 males, as shown in table 1. According to gender the incidence of pulp stone in females was slightly higher than in males. However, the difference was no significant (P-value= 0.188).

We used Fisher's exact test to compare and evaluate the relationship between two variables of age and prevalence of pulp stone (P-value=0.030). The age group from 20-30 years showed higher frequency of pulp stone as compared to other groups

(30.67%). However, the number of patients with pulp stone is significantly lower than the number of patients without pulp stone in the age group from 20-30 years.

As we see in table 3 the highest frequency of pulp stone was found in maxillary left first molars (37.14%) followed by maxillary right first and second molars and mandibular right first molars showed the lowest occurrence (4.29%).

4 patients showed pulp stones in every 4 quadrants (5.33%) and 2 patients had pulp stones in all quadrants except left mandible (2.66%), also 4 patients had pulp stones in all quadrants except right mandible (5.33%).

Discussion:

In the present study panoramic radiography was the criteria for the identification of pulp stone, although the best method is microscopy which reports more frequency because of its high accuracy. Any way radiography is considered as the most common and non-invasive method. Pulp stones with a diameter less than 200 μm are not seen on radiographs. (18, 19)

The frequency of pulp stone was 15.21% in the present study which was less than the reported prevalence in studies performed by Ranjitkar et al. (1), Baghdady et al. (20) and other studies. (14,16, 21)

The studies performed by Colak et al. (22) and Turkal et al. (23) reported higher prevalence in females than males (P-value=0.188). However, Baghdady et al. (20) reported more common pulp stones in males than females. Although there were many studies which reported no significant difference between two genders about incidence of pulp stone. (1, 14, 24-27)

In the present study a significant relationship was found between age and prevalence of pulp stone and the highest

occurrence was reported in the 20-30 years age group (P-value=0.030). However, in some studies no significant relationship was found. (23) Also there are some studies in which the prevalence of pulp stones is higher at older ages like the 5th decade. (28) In the present study the highest frequency of pulp stone was found in maxillary left first molars (37.14%) followed by maxillary right first and second molars and mandibular right first molars showed the lowest occurrence (4.29%), these results were similar to the results of other studies (19, 22, 23), although there are some studies in which mandibular molars showed the highest prevalence of pulp stones. (14, 20, 29) The first permanent teeth which erupt in the oral cavity are first molars and they tolerate most of occlusal forces because of their larger surface area perhaps leading to early degenerative changes. In addition first molars have the biggest pulp chamber and rich blood supply (16, 30) and these factors lead to increased calcifications. It should be noted that pulp pathologies are not the only reasons for forming pulp stones, because occurrence of pulp stones is reported even in young subjects. (18)

Pulp stones do not have clinical symptoms and can be formed within the pulp of the tooth, either within the crown or within the root canals and they can disrupt the treatment process (31), However, this problem can be easily managed by providing proper access cavity and the use of appropriate tools during treatment.

Conclusion:

It is concluded that the incidence and distribution of pulp stones was more in maxillary teeth and in patients in the age group from 20-30 years. The incidence was more among the maxillary left first molars.

The data concluded from the present study could serve as a useful aid for endodontists in root canal treatment procedures.

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Reference:

1. Ranjitkar S, Taylor JA, Townsend GC. A radiographic assessment of the prevalence of pulp stones in Australians. *Australian dental journal*. 2002 Mar;47(1):36-40.
2. Johnson PL, Bevelander G. Histogenesis and histochemistry of pulpal calcification. *Journal of Dental Research*. 1956 Oct;35(5):714-22.
3. Goga R, Chandler NP, Oginni AO. Pulp stones: a review. *International Endodontic Journal*. 2008 Jun;41(6):457-68.
4. VanDenBerghe JM, Panther B, Gound TG. Pulp stones throughout the dentition of monozygotic twins A case report. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 1999 Jun 1;87(6):749-51.
5. Bahetwar SK, Pandey RK. An unusual case report of generalized pulp stones in young permanent dentition. *Contemporary clinical dentistry*. 2010 Oct;1(4):281.
6. Ciftcioglu N, Ciftcioglu V, Vali H, Turcott E, Kajander EO. Sedimentary rocks in our mouth: dental pulp stones made by nanobacteria. *Instruments, Methods, and Missions for Astrobiology* 1998 Jul 6 (Vol. 3441, pp. 130-137). International Society for Optics and Photonics.
7. Hillmann G, Geurtsen W. Light-microscopical investigation of the distribution of extracellular matrix molecules and calcifications in human dental pulps of various ages. *Cell and tissue research*. 1997 Jun 1;289(1):145-54.
8. Holtgrave EA, Hopfenmüller W, Ammar S. Abnormal pulp calcification in primary molars after fluoride supplementation. *Journal of Dentistry for Children*. 2002 May 1;69(2):201-6.
9. Siskos GJ, Georgopoulou M. Unusual case of general pulp calcification (pulp stones) in a young Greek girl. *Dental Traumatology*. 1990 Dec;6(6):282-4.
10. Bauss O, Neter D, Rahman A. Prevalence of pulp calcifications in patients with Marfan syndrome. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2008 Dec 1;106(6):e56-61.
11. Sundell JR, Stanley HR, White CL. The relationship of coronal pulp stone formation to experimental operative procedures. *Oral Surgery, Oral Medicine, Oral Pathology*. 1968 Apr 1;25(4):579-89.
12. White S. Benign tumor of jaw. *Oral radiology. Principles and interpretation*. 2004:410-58.
13. Sayegh FS, Reed AJ. Calcification in the dental pulp. *Oral Surgery, Oral Medicine, Oral Pathology*. 1968 Jun 1;25(6):873-82.
14. Hamasha AA, Darwazeh A. Prevalence of pulp stones in Jordanian adults. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 1998 Dec 1;86(6):730-2.
15. Hill TJ. Pathology of the dental pulp. *Journal of the American Dental Association*. 1934 May 1;21(5):820-44.

16. Tamse A, Kaffe I, Littner MM, Shani R. Statistical evaluation of radiologic survey of pulp stones. *Journal of Endodontics*. 1982 Jan 1;8(10):455-8.
17. Sisman Y, Aktan AM, Tar?m-Ertas E, Ciftçi ME, ?ekerci AE. The prevalence of pulp stones in a Turkish population. A radiographic survey. *Medicina oral, patologia oral y cirugia bucal*. 2012 Mar;17(2):e212.
18. Kronfeld R. *Histopathology of the Teeth: And Their Surrounding Structures*. Lea & Febiger; 1955.
19. Sener S, Cobankara FK, Akg?nülü F. Calcifications of the pulp chamber: prevalence and implicated factors. *Clinical oral investigations*. 2009 Jun 1;13(2):209.
20. Baghdady VS, Ghose LJ, Nahoom HY. Prevalence of pulp stones in a teenage Iraqi group. *Journal of Endodontics*. 1988 Jun 1;14(6):309-11.
21. Ravanshad S, Khayat S, Freidonpour N. The prevalence of pulp stones in adult patients of Shiraz Dental School, a Radiographic Assessment. *Journal of Dentistry*. 2015 Dec;16(4):356.
22. Colak H, Celebi AA, Hamidi MM, Bayraktar Y, Colak T, Uzgur R. Assessment of the prevalence of pulp stones in a sample of Turkish Central Anatolian population. *The Scientific World Journal*. 2012;2012.
23. Turkal M, Tan E, Uzgur R, Hamidi MM, Colak H, Uzgur Z. Incidence and distribution of pulp stones found in radiographic dental examination of adult Turkish dental patients. *Annals of medical and health sciences research*. 2013;3(4):572-6.
24. Gulsahi A, Cebeci AI, ?zden S. A radiographic assessment of the prevalence of pulp stones in a group of Turkish dental patients. *International endodontic journal*. 2009 Aug;42(8):735-9.
25. Kazemizadeh Z, Zargarpoor R, AHMADI KJ. A Radiographic Assessment of the Prevalence of Pulp Stones in Patients Referred to Rafsanjan Faculty of Dentistry in 2008.
26. Sisman Y, Aktan AM, Tar?m-Ertas E, Ciftçi ME, ?ekerci AE. The prevalence of pulp stones in a Turkish population. A radiographic survey. *Medicina oral, patologia oral y cirugia bucal*. 2012 Mar;17(2):e212.
27. Talla HV, Kommineni NK, Yalamancheli S, Avula JS, Chillakuru D. A study on pulp stones in a group of the population in Andhra Pradesh, India: An institutional study. *Journal of*
28. Al-Nazhan S, Al-Shamrani S. A radiographic assessment of the prevalence of pulp stones in Saudi adults. *Saudi Endodontic Journal*. 2011 Jan 1;1(1):19-26.
29. Elvery MW, Savage NW, Wood WB. Radiographic study of the broadbeach aboriginal dentition. *Am J Phys Anthropol*. 1998; 107: 211–219.
30. Langeland K, Rodrigues H, Dowden W. Periodontal disease, bacteria, and pulpal histopathology. *Oral Surg Oral Med Oral Pathol*. 1974; 37: 257–270.
31. Lovdahl PE, Gutmann JL. Problems in locating and negotiating fine and calcified canals. In: Gutmann JL, Dumsha TC, Lovdahl PE, Hovland EJ, editors. *Prevention, identification and management*. 3rd ed. Mosby: St Louis; 1997. p. 69.

Tables:**Table 1:** Prevalence of pulp stones and distribution between sexes

		Gender								
		Male			Female			Total		
Pulp stone		F	P (%) in column	P (%) in row	F	P (%) in column	P (%) in row	F	P (%) in column	P (%) in row
	Yes	20	12.20%	26.67%	55	16.72%	73.33%	75	15.21%	100%
	No	144	87.80%	34.45%	274	83.28%	65.55%	418	84.79%	100%

F, frequency; P, Percentage.

Table2: Prevalence of pulp stones in relation to age group

		Pulp Stone			
		Yes		No	
		frequency	percentage	frequency	percentage
age classification	10-20	14	18.67%	57	13.64%
	20-30	23	30.67%	193	46.17%
	30-40	22	29.33%	120	28.71%
	40-50	13	17.33%	42	10.05%
	50-60	3	4.00%	6	1.44%
	total	75	100.00%	418	100.00%

Table 3: Prevalence of pulp stones by dental arch

		frequency	percentage in column	total percentage
right maxillary tooth number	6,7	16	33.33%	22.86%
	6	16	33.33%	22.86%
	7	16	33.33%	22.86%
left maxillary tooth number	6,7	12	24.00%	17.14%
	6	26	52.00%	37.14%
	7	12	24.00%	17.14%
right mandibular tooth number	6,7	3	25.00%	4.29%
	6	3	25.00%	4.29%
	7	6	50.00%	8.57%
left mandibular tooth number	6,7	4	26.67%	5.71%
	6	4	26.67%	5.71%
	7	7	46.67%	10.00%